Rockwell Science Center

InP HBT PROCESS LOT FOLLOWER Roc1-4a

Charge # 35016 – 87258-0000

ROC1-4 A

Lot Identification

Mask set : ROC1

Lot number: 4

Schedule Information

Start date: April 12, 2001

Wafers started : 8

Charge Information

Wafer Fabrication and test: 35016 – 87258 -000

Process Layer Information

List wafers in lot :

	Wafer Number	No Substrate Number	
1.	Intelliepi	DHBT 2429B3B4	IQE baseline DHBT F8879.021XT
2.		DHBT 2429B3B3	IQE " " F8879.022XT
3.			IQE baseline SHBT F8879.025XT
4.			IQE " " F8879.027XT
5.			
6.			

Material sheets at the back of the follower

Comments:
Created by RLP 2/27/01,

Attachment 3
Page 1 of 68

* DO NOT process at the same time as Roc1-4b & Roc1-4c. Thanks!

Rockwell Science Center

InP HBT PROCESS LOT FOLLOWER

Charge # 35016 – 87258-0000

Emitter Contact / Alignment Marks	Step	Date/ Oper.	Tools	Step operation (6 WFRS)	Operation recipe	Notes
Wafer clean Close Couple with PR	0.1	4/18/01	Wet station	Dip, dry	NH4OH (2%), 30sec, DI rinse, 30sec, N2 blow dry	
HMDS Dep	1	4-19 ER	YES Oven	HMDS Dep	Program 0 ✓ REWORK	4-19-01 ER
Apply resist/bake (target 2.5um)	2	4/19	Solitec Coat	Resist type Spin resist Hotplate bake	~~3625L~~ 5181 511 ~~2600 RPM 60~~ sec 3500 RPM 30 SEC 110C, 60sec REWORK WITH 511	4-20-01 ER
Expose Device Mask	5	4/19	GCA Stepper	Mask / Reticle name Global align to DFAS align to Vernier align to Job name\ pass	ROC1 / Layer 1B This should be a light field mask! Blind Step Fix Roc11.5/1	4·20-01
Image Reversal Bake	5.1	4/23	YES Oven	Ammonia Program:	3	
Flood	5.2	4/23	Flood Unit	Dose	~~800~~ mj ~~[illegible]~~ 1000MS	
Develop	6	4/23	Solitec DEV.	Develop Type: Develop Time:	701 60 Sec.	
Inspect wafers	7	4/23	Optical scope	View wafers	Equipment type A O Microscope ◊ Check for patterns properly developed ◊ Check alignment (+/- 0.25um) ◊ Smallest Resolution Pattern Read .7 (µm) Acceptance : Yes___, No___	
Descum	0.7	4/25	Branson 1	Descum	O2, 500mT, 300W, 4min	
Dip Etch	0.1	4/25	Wet station	Dip, dry	20% HCl 30sec, DI rinse, 30sec, N2 blow dry	
Metal deposition	0.9	4/25/01 KC	CRYO evaporator II # 63	Metal dep Ti/Pt/Au/Ti Metal dep check	150 / 200 / 5000 / 30 Record film thickness from crystal monitor	
Liftoff	0.10	4-25-01	Wet bench	Liftoff Rinse Dry Clean backside	Acetone soak, >10min IPA soak, 1min N2 blow Scrape flakes off backside with razor blade if needed Clean Ace Soak, IPA Soak, DI Rinse, SRD Dry	4/26/01
Inspect wafers	0.11	4/26	Optical scope	Inspect wafers	Metal appearance Check that alignment marks are completely lifted .5 C. Hall	

BACKSIDE POLISHED WAFERS TIR 9 µm WITHOUT SR#S

UNPOLISHED WAFERS WITH SR#S TIR 7µ

TEST WF TIR 4 µm

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Rockwell Science Center InP HBT PROCESS LOT FOLLOWER Charge # 35016 – 87258-0000

Emitter Mesa Etch	Step	Date/ Oper.	Tools	Step operation	Operation recipe	Notes
Measure step height		4/26 Sm	Dektak	Measure Metal pattern Measure PR pattern	Record Data	
Descum	0.7	4/26 Sm	Branson I	Descum	O2, 500mT, 300W, 4min	
Etch emitter mesa	0.8	4/26 Sm	Wet bench / Dektak	Dektak Dip Rinse Etch Rinse Dektak	Record etch sheet : NH4OH (2%) + tergitol 30 sec : DI Rise 1:8:160 HS3O4 + H2O2 +H20 + Tergital 60 1/2 HCl : H2O + Tergital	
Measure step height		4/26 Sm	Dektak	Measure Metal pattern Measure PR pattern	Record Data Record Etch depth and Rate	
Inspect wafers	0.6	Sm 4/26	Optical scope	View wafers	**Equipment type A O Microscope** ◊ **Check for complete etch** **Acceptance : Yes** X **, No** ___	

E3 7700 Emitter Mesa Etch

E2 6650

25 E1 5750

M. 5050

E1 700

E2 900

1600

E3 1050

2650

27 7800

5050

2750

2% NH_4OH 30 Sec.

23.3A/Sec. 1:8:160 30 Sec.

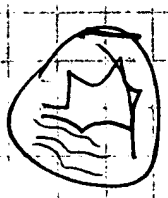
+50 Sec.

60% HCl 15 Sec.

30 - 1:30 - 15

21 2650Å 30 - 1:30 - 13

22 2750Å 30 - 1:30 - 13

Not  2350Å 30 - 1:30 - 12

1:8:160 overetched by ≅ 20 sec.

waiting for Color change that

didn't come

Not  2250Å 30 - 1:15 - 12

109714

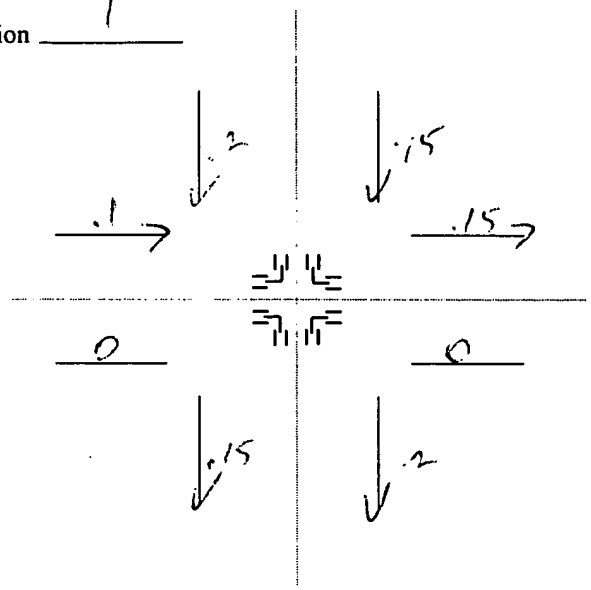
Rockwell Science Center

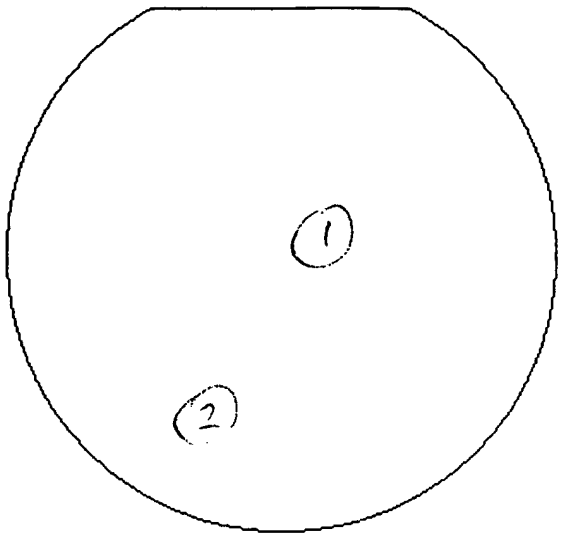
InP HBT PROCESS LOT FOLLOWER 6 WAFERS Charge # 35016 – 87258-0000

Base Metal (Optical)	Step	Date/ Oper.	Tools	Step operation	Operation recipe	Notes
Wafer clean Close Couple with PR	0.1	4/24 Scott	Wet station	Dip, dry	NH4OH (2%), 30sec, DI rinse, 30sec, N2 blow dry	
HMDS Dep	1	4-24 PM	YES Oven	HMDS Dep	Program 0 ✓	
Apply resist/bake (target 2.5um)	2	4-24 PM	Solitec Coat	Resist type Spin resist Hotplate bake	511 4000 2600 RPM 60 sec 110C, 60sec	
Expose Device Mask	**5**	4-24 PM	GCA Stepper	Mask / Reticle name Global align to DFAS align to Vernier align to Job name\ pass	ROC1 / Layer 5 13 1 1 .53 1 MAP ROCH.3\M,5	
Image Reversal Bake	5.1	4/24 PM	YES Oven	Ammonia Program:	3	
Flood	5.2	4-27 ER	Flood Unit	Dose	600 mj ✓	
Develop	**6**	4-27 ER	Solitec DEV.	Develop Type: Develop Time:	701 ✓ 60 Sec ✓	
Inspect wafers	7	4-27 PM	Optical scope	View wafers	**Equipment type A O Microscope** ◊ **Check for patterns properly developed** X 0 Y +2 ◊ **Check alignment (+/- 0.25um)** ◊ **Smallest Resolution Pattern Read** .8 **(μm)** **Acceptance : Yes** ✓ **, No** ___	
Descum	0.7	4/30 Scott	Branson 1	Descum	O2, 500mT, 300W, 4min	
Dip Etch	0.1	4/30 SCOTT	Wet station	Dip, dry	20% HCl 30sec, DI rinse, 30sec, N2 blow dry	
Metal deposition	0.9	4/30 CR	CRYO evaporator	Metal dep Ti/Pt/Au/Ti Metal dep check	100 / 150 / 1500 / 30 Record film thickness from crystal monitor	
Liftoff	0.10	5/1 Scott	Wet bench	Liftoff Rinse Dry Clean backside	Acetone soak, >10min IPA soak, 1min N2 blow Scrape flakes off backside with razor blade if needed	
Inspect wafers	0.11	5/1 Scott	Optical scope	Inspect wafers	Metal appearance Check that alignment marks are completely lifted	

Wafer # 021

Location 1





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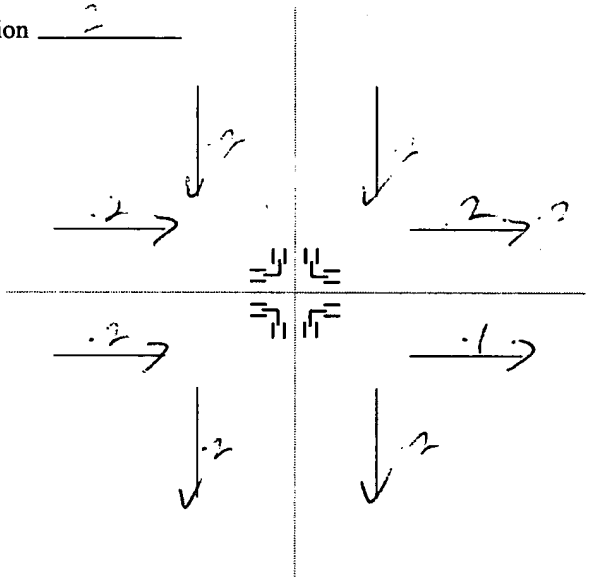

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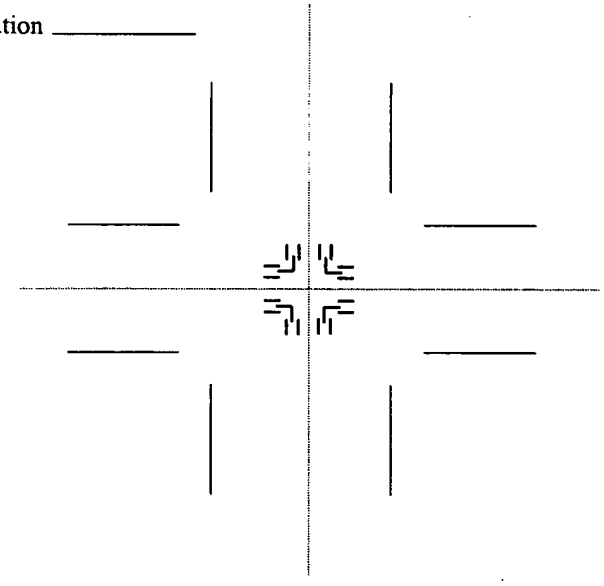
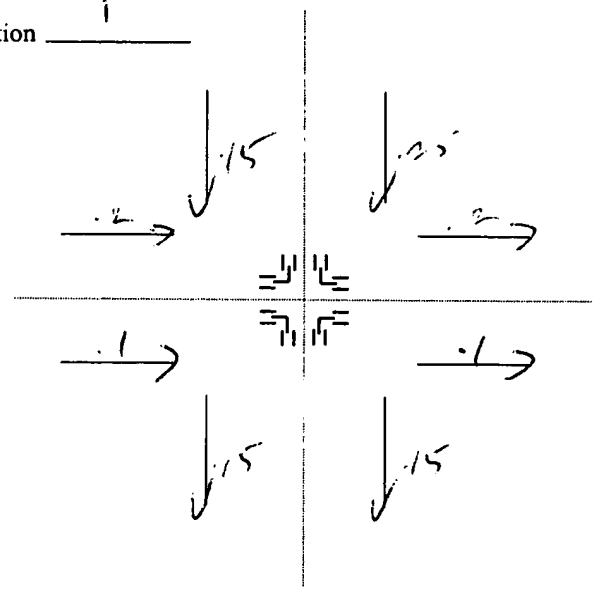
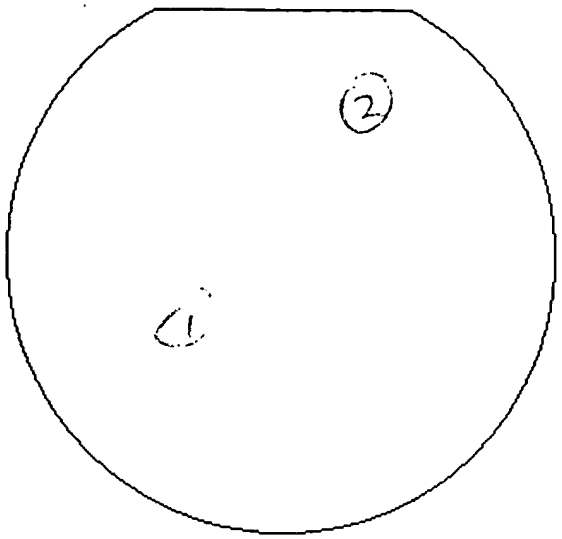


Wafer # 025

Location 1





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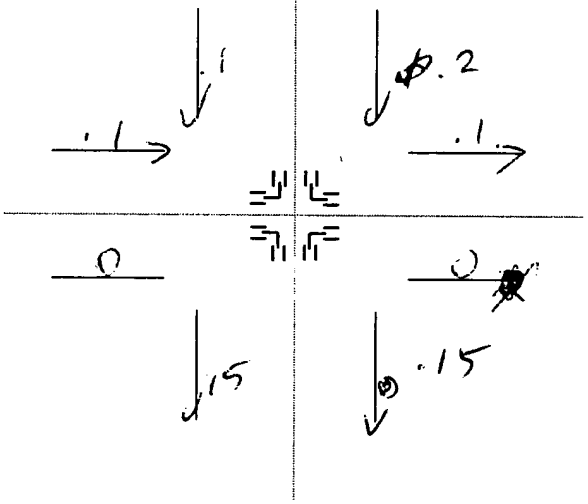

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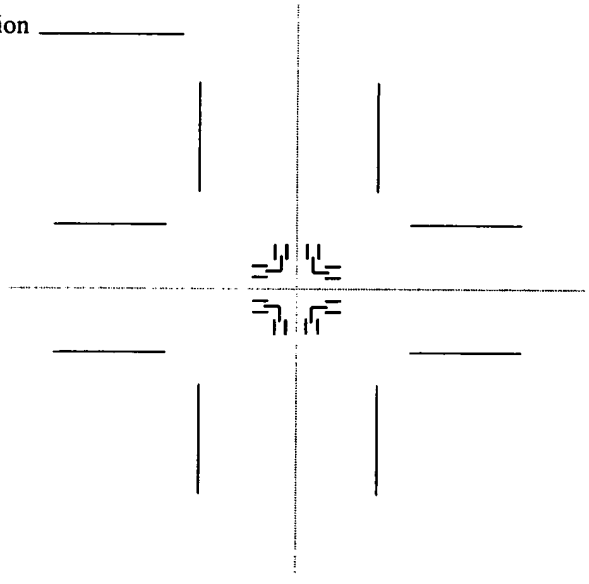
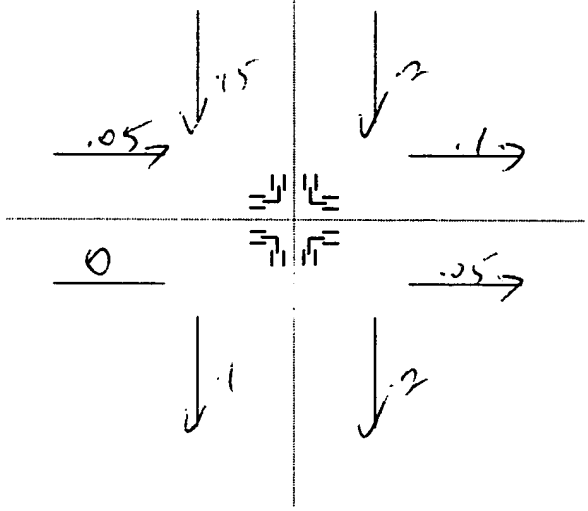
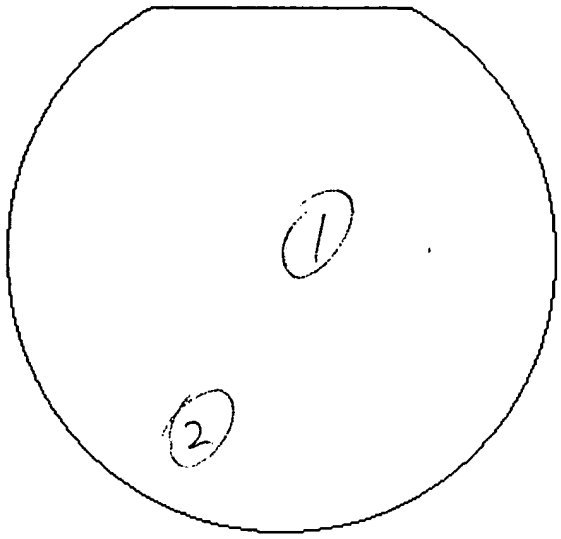


Wafer # NO #

Location 1





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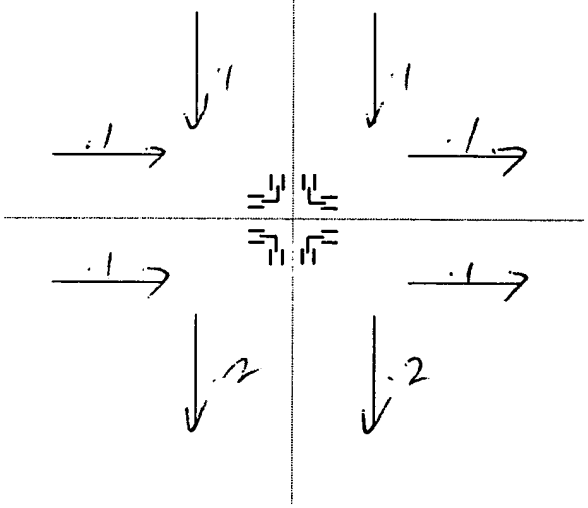

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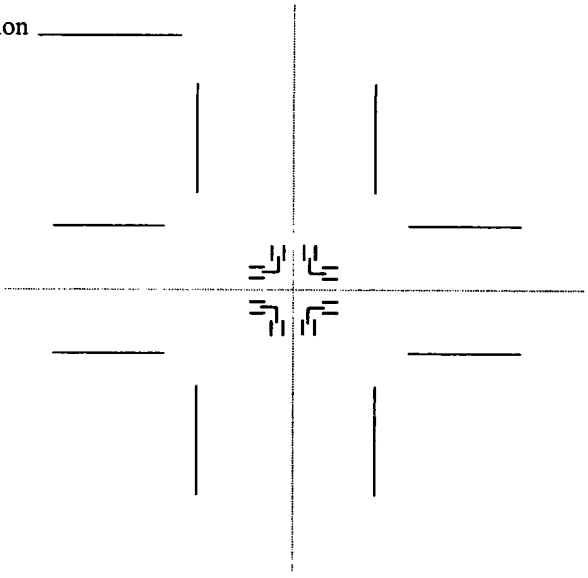
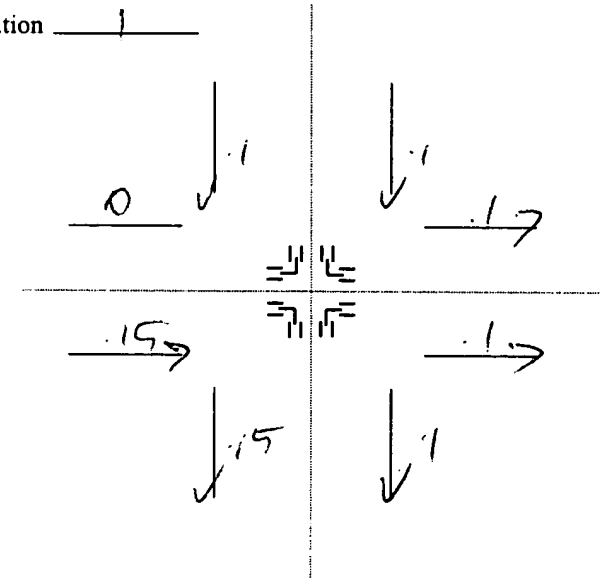
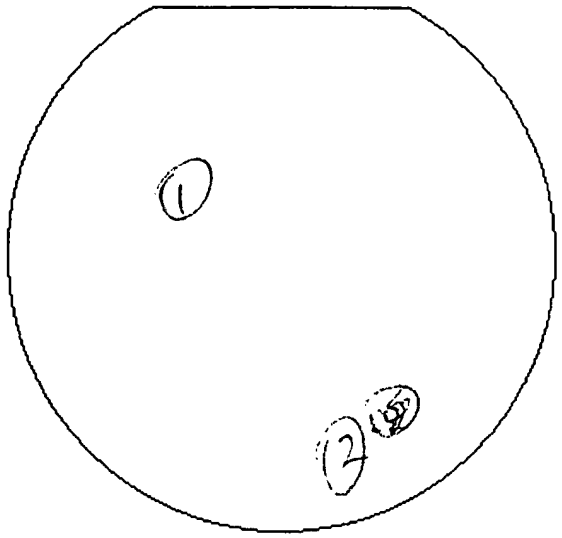


Wafer # 027

Location 1





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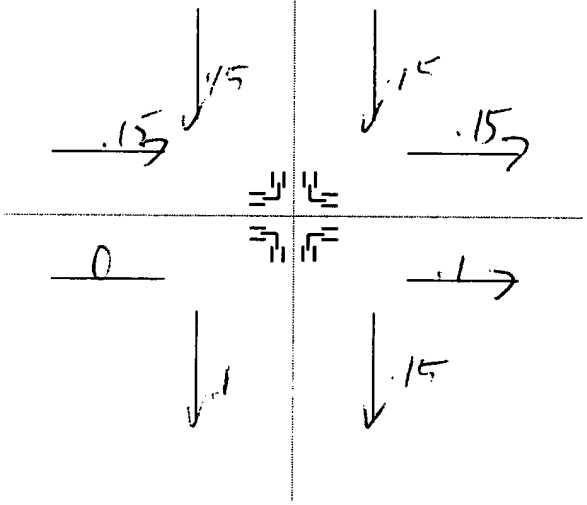

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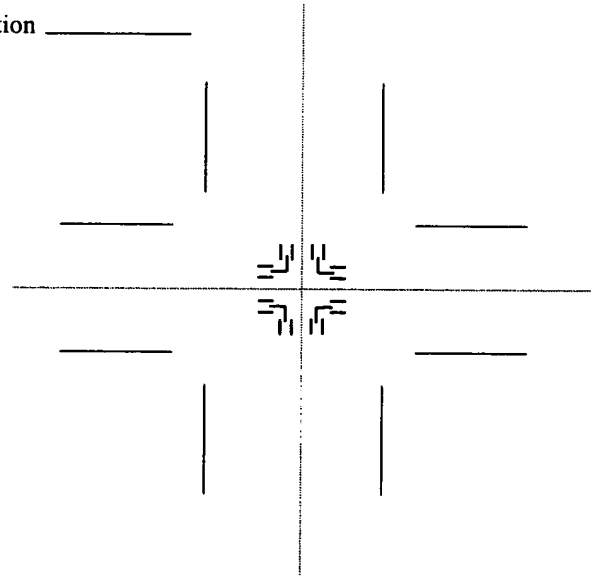
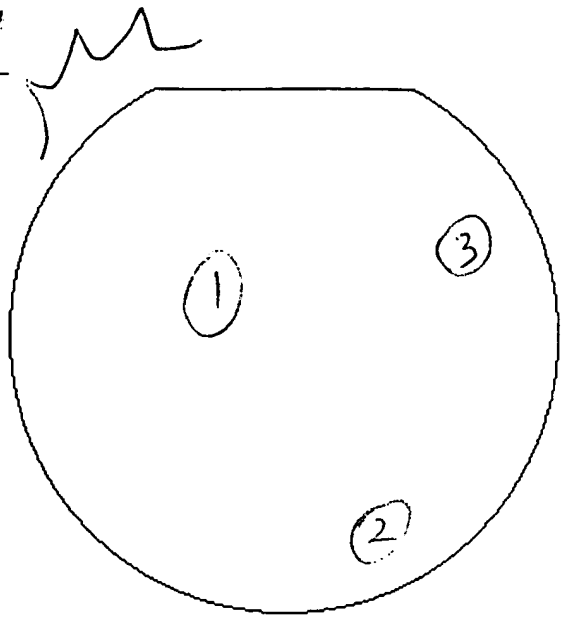


Wafer # No #



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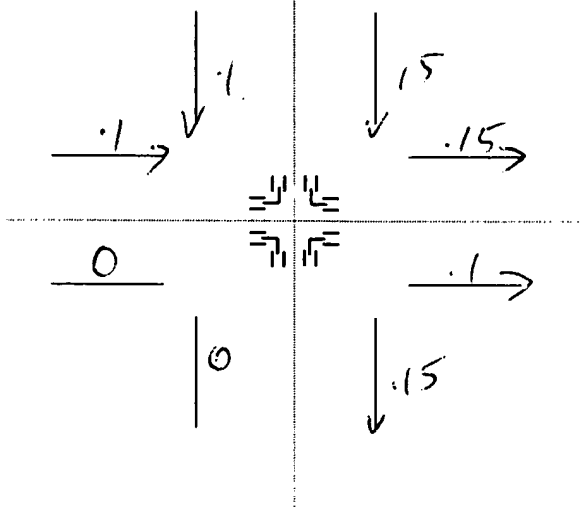

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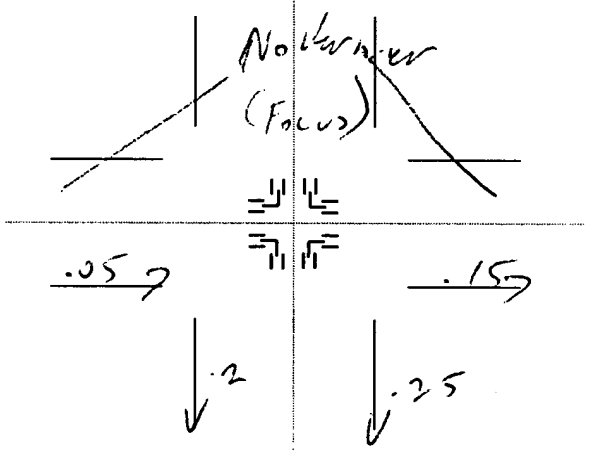
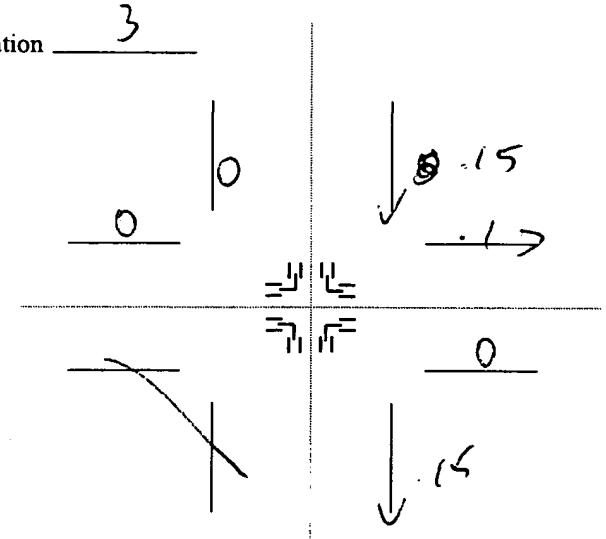
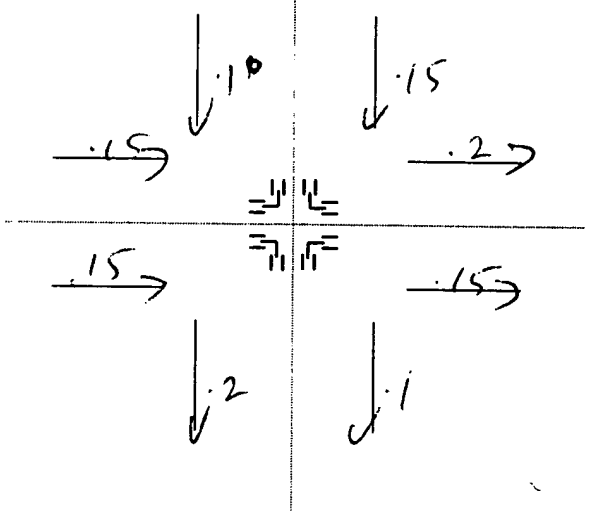


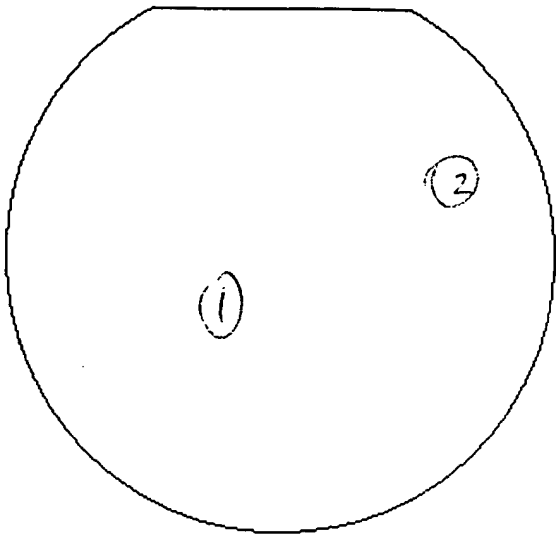
Location 3



Wafer # 022

Location 1





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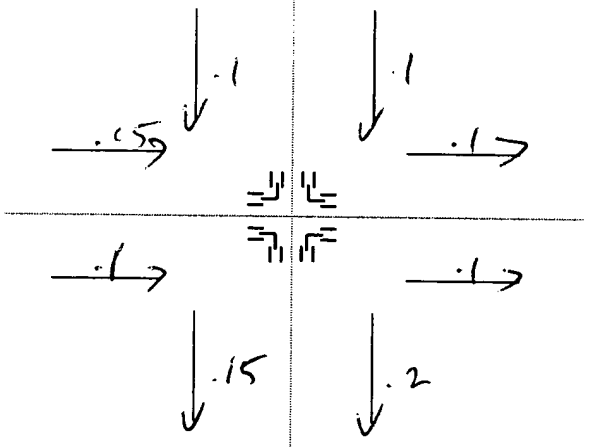
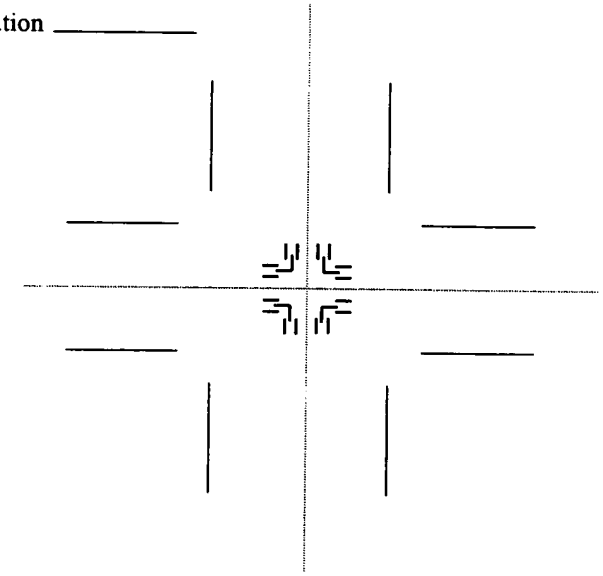


Location _____



Rockwell Science Center InP HBT PROCESS LOT FOLLOWER (6 WFRS) Charge # 35016 – 87258-0000

Base Pedestal	Step	Date/ Oper.	Tools	Step operation	Operation recipe	Notes
Wafer clean	0.1	5/10/01 SM	Wet station	Dip, dry	NH4OH (2%), 30sec, DI rinse, 30sec, N2 blow dry	
HMDS Dep	1	5-1 ER	YES Oven	HMDS Dep	Program 0 ✓	
Apply resist/bake (target 2.5 um)	2	5-1 ER	Solitec Coat	Resist type Spin resist Hotplate bake	511 ✓ 4000 RPM (3000) 30 sec ✓ 110C, 60sec ✓	
Expose Device Mask	5	5/1 PM	GCA Stepper	Mask / Reticle name Global align to DFAS align to Vernier align to Job name\ pass	ROC1 / Layer 4 1 1 1 MAP ROC11.3\M1,4. EXP -6	
Develop	6	5-1 ER	Solitec DEV.	Develop Type: Develop Time:	701 ✓ 60 Sec. ✓	
Inspect wafers	7	5-1 PM	Optical scope	View wafers MADE ALIGNMENT ADJUSTMENT IN Y.	**Equipment type A O Microscope** ◊ **Check for patterns properly developed** ◊ **Check alignment (+/- 0.25μm)** ◊ **Smallest Resolution Pattern Read** 0.8 **(μm)** **Acceptance : Yes___ , No___**	
Post Bake		5/2 SM	Ovens in Lab 335	Post bake PR	90C 30min 5/4 SM	
Descum	0.7	✓	Branson 1	Descum	O2, 500mT, 300W, 4min	
Pedestal Etch	0.8		Wet bench	~~O~~ See sheets		
PR strip	0.10	5/10 SM	Wet bench	Liftoff Rinse Dry	Acetone soak, 10min IPA soak, 1min N2 blow	
Inspect wafers	0.11	PM	Optical scope	View wafers	Check SiO appearance	

InP HBT PROCESS LOT FOLLOWER

Wafer 025 SHBT Step BP Charge # 35016 – 87258-0000 Lot # ROC1-4

Etch Time	Etchant	Ref THK	DEKTAK	Etch Amount	Etch Rate
90"	1:8:160	10825	–	–	~> 368Å/sec
+ 10"	HCl 2:1		~14150	3325	

Comments and Pictures:

InP HBT PROCESS LOT FOLLOWER

Wafer 027 ~~DEBT~~ SHB Step B-P Charge # 35016 – 87258-0000 Lot # ROC1-4

Etch Time	Etchant	Ref THK	DEKTAK	Etch Amount	Etch Rate
105"	1:8:160	10900	14130	3230	~~3000~~ 307 Å/SEC
+10"	~~2~~ 2:1 HCl	–	–		

Torr

Comments and Pictures:

I-V AFTER HCl
Very linear ~ 150Ω

InP HBT PROCESS LOT FOLLOWER

Wafer 021 DHB1 Step BP Charge # 35016 – 87258-0000 Lot # Roc1-4

Etch Time	Etchant	Ref THK	DEKTAK	Etch Amount	Etch Rate
30"	1:8:160	10 750	etch to	color	
7	2:1 HCl		13600	2850'	Etched by Cerby

Comments and Pictures:

~~13600~~ 10750

InP HBT PROCESS LOT FOLLOWER

Wafer 022 Step B@ Charge # 35016 – 87258-0000 Lot # Rock-4

Etch Time	Etchant	Ref THK	DEKTAK	Etch Amount	Etch Rate
~30"	1:8:160	10750	—	—	Clear by Color
7"	2:1 HCl		13530	2780	

Comments and Pictures:

I-V was linear ~650Ω

InP HBT PROCESS LOT FOLLOWER

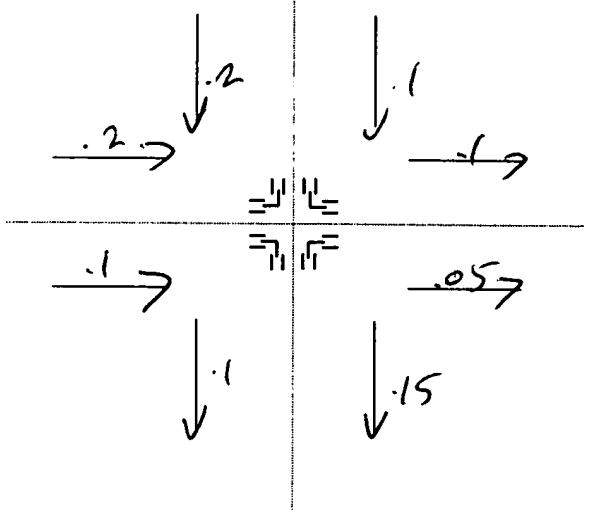
Wafer No # 1 DNDT Step B2D Charge # 35016 – 87258-0000 Lot # 2001-4

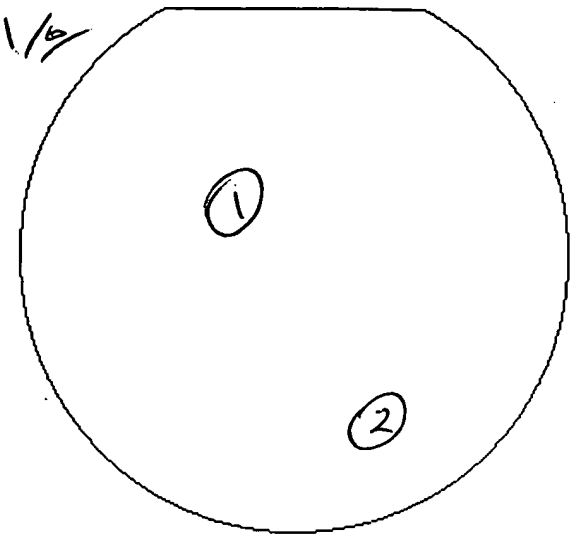
Etch Time	Etchant	Ref THK	DEKTAK	Etch Amount	Etch Rate
30"	1:8:160	10800	etch by color		
10"	2:1 HCl				
No # 2					
30"	1:8:160	10775	etched by color		
10"	2:1 HCl				

Comments and Pictures:

Wafer # no #

Location 1





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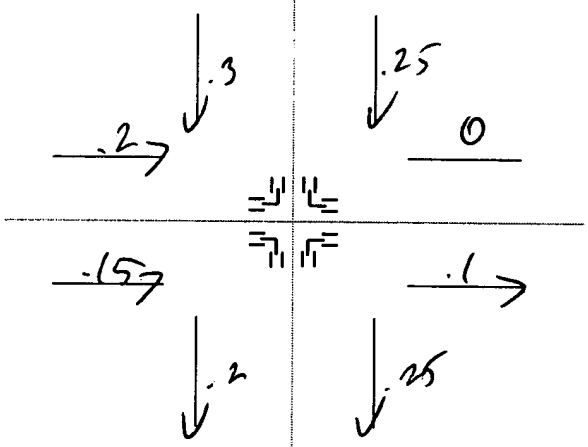

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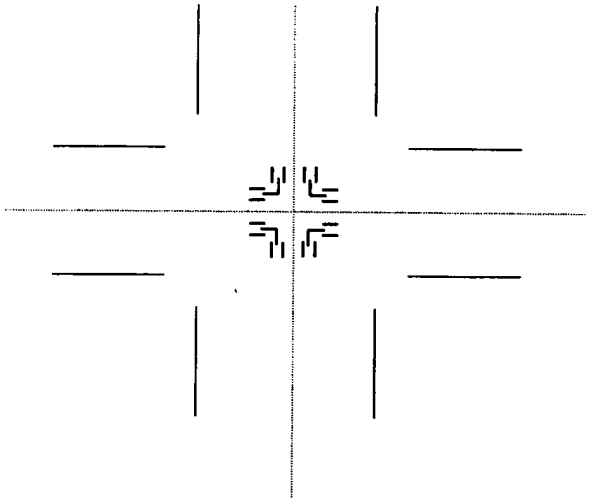
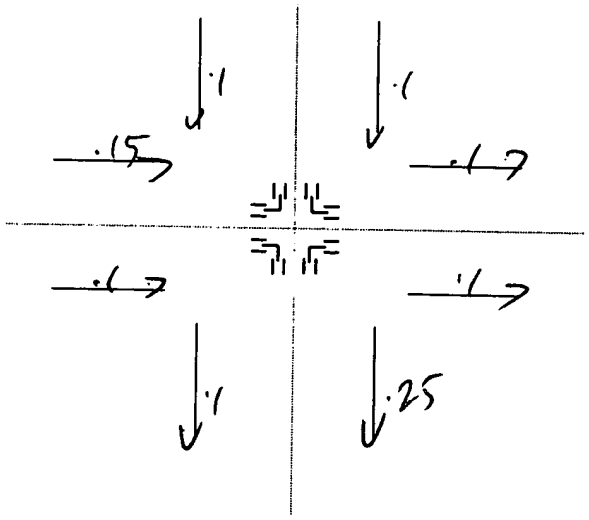
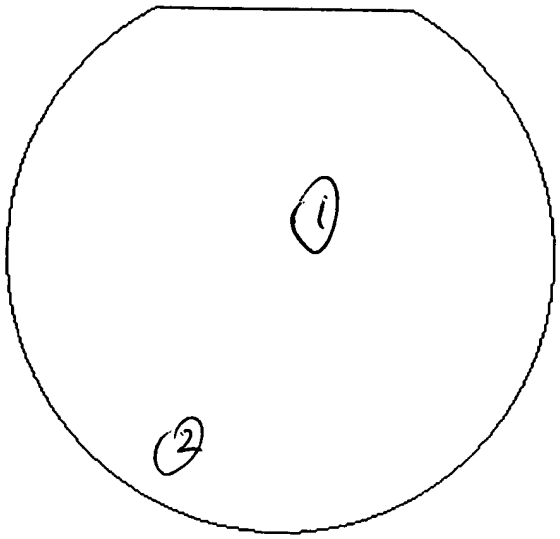


Wafer # 027

Location 1





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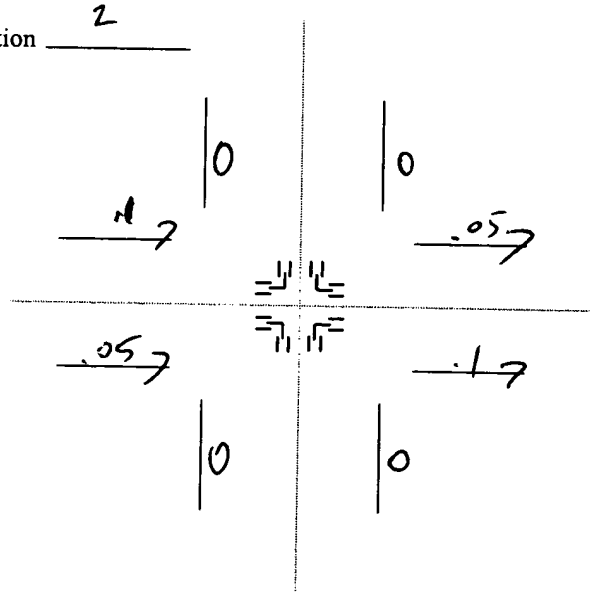
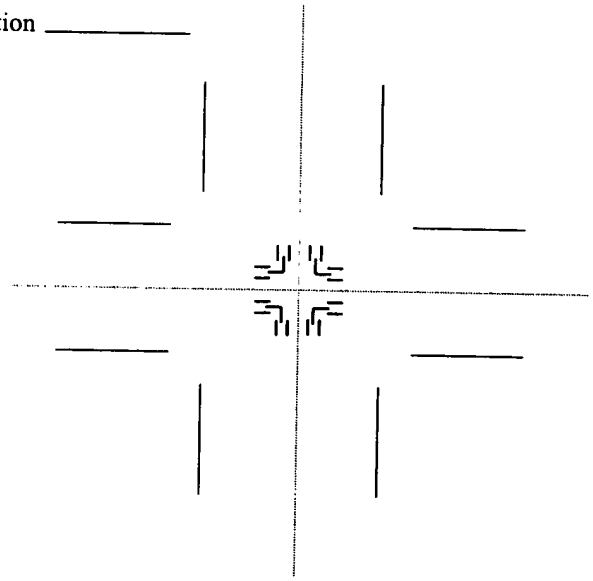
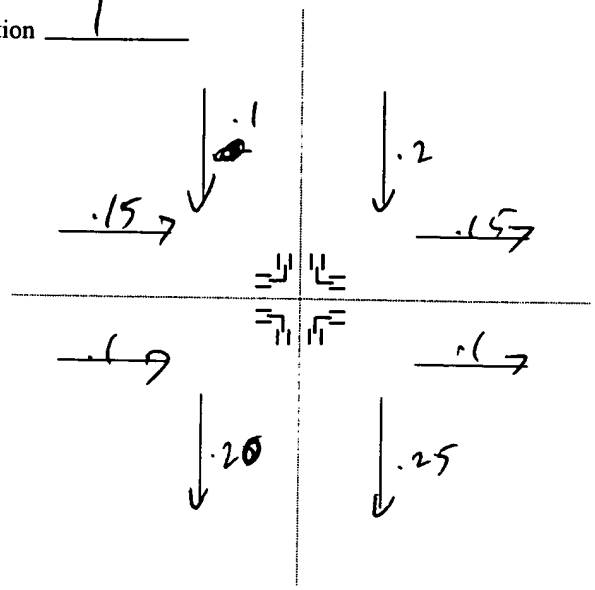


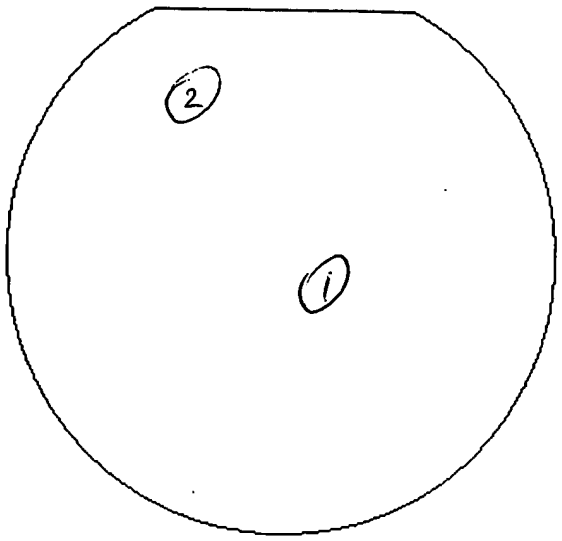
Location _____



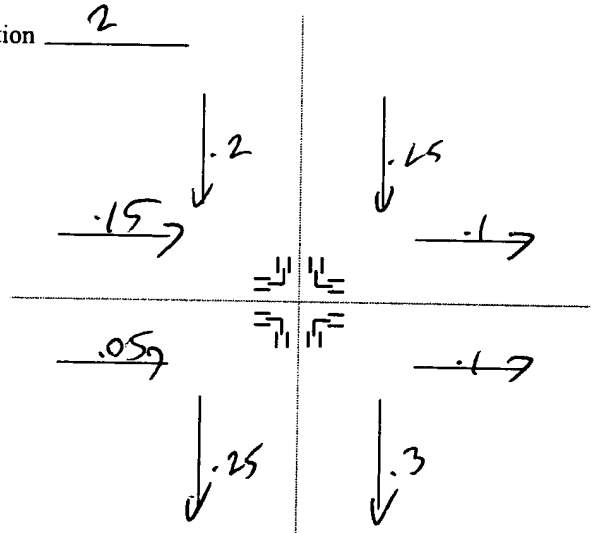
Wafer # 22

Location 1

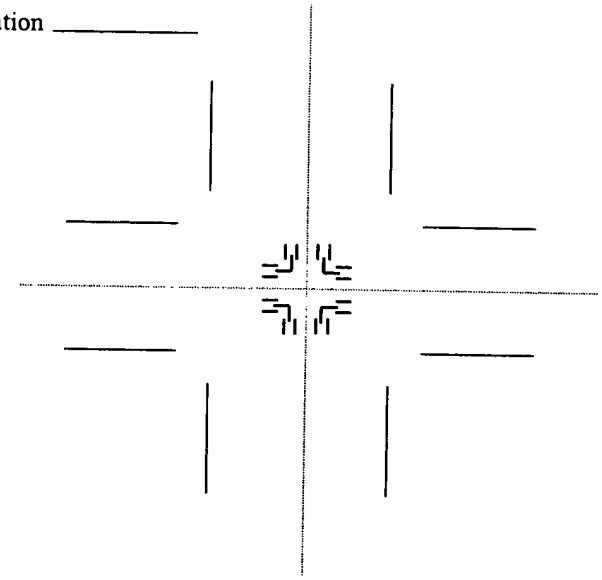




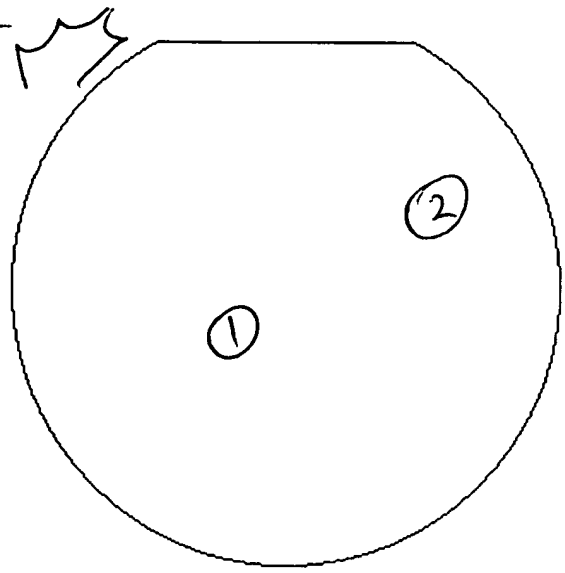
Location 2



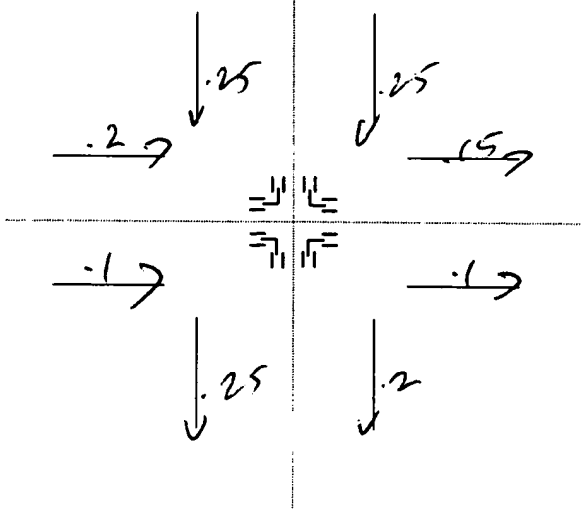
Location _____



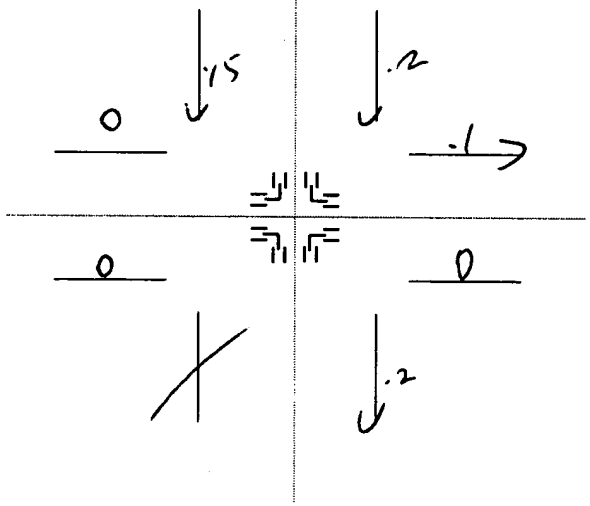
Wafer # No #



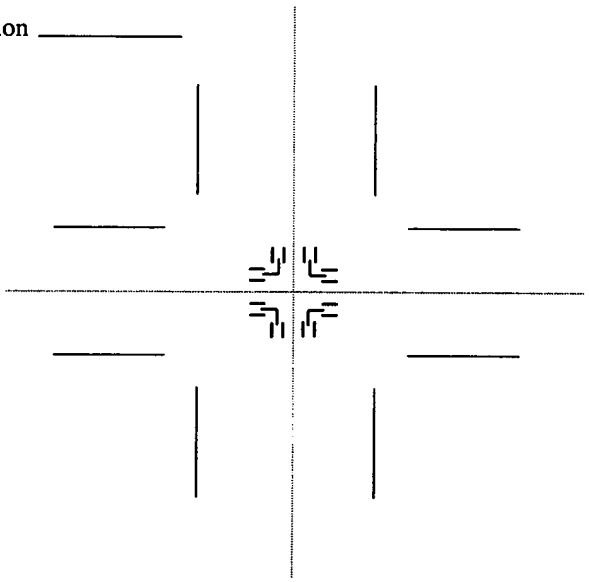
Location 1



Location 2

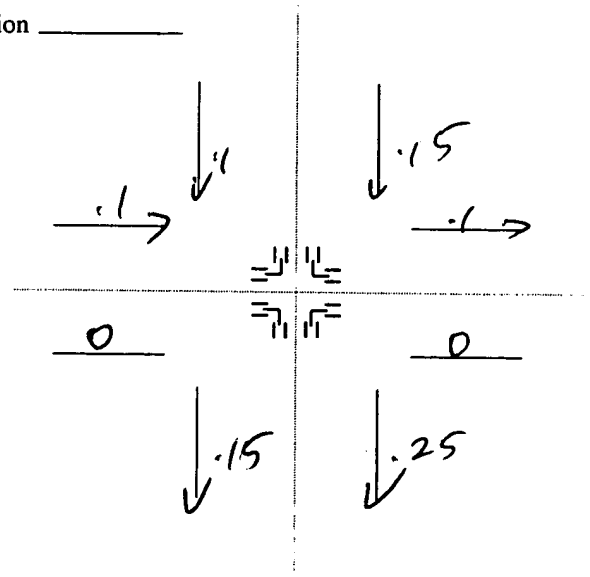


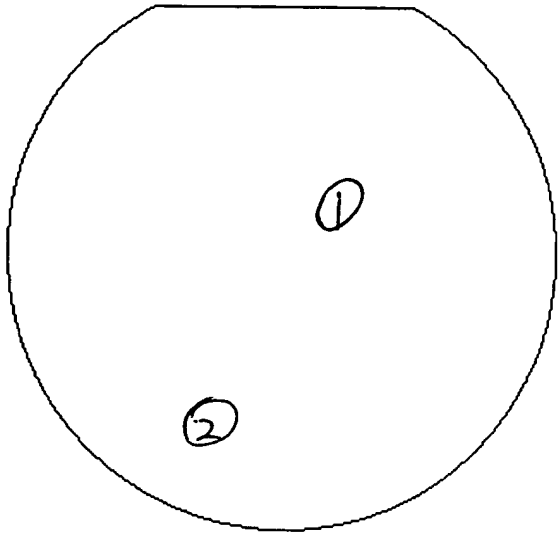
Location _____



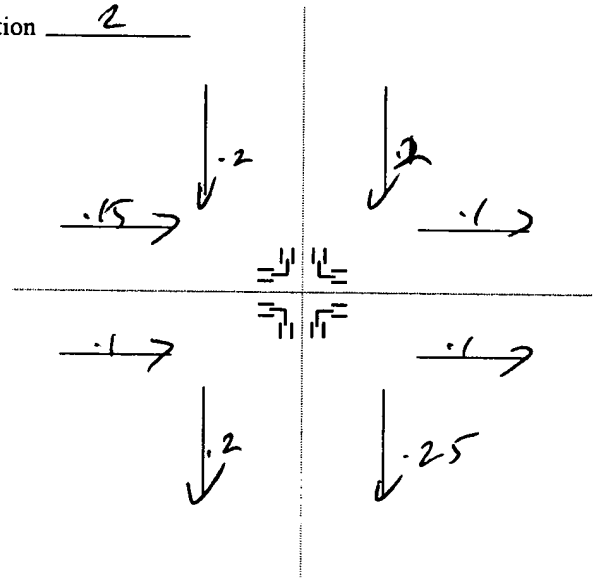
Wafer # 021

Location _____

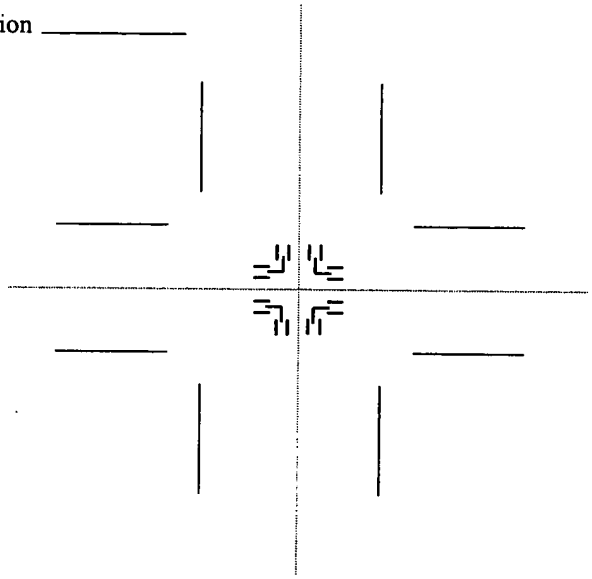




Location 2

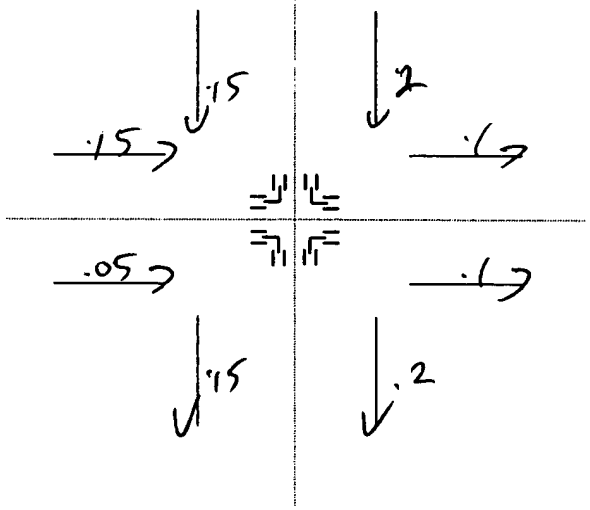


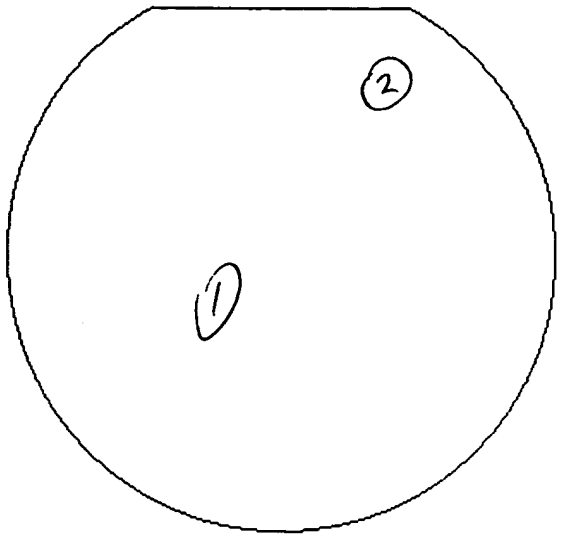
Location _____



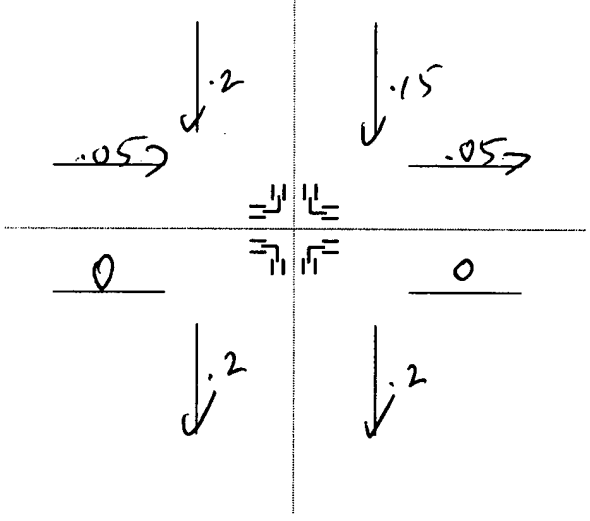
Wafer # 025

Location 1

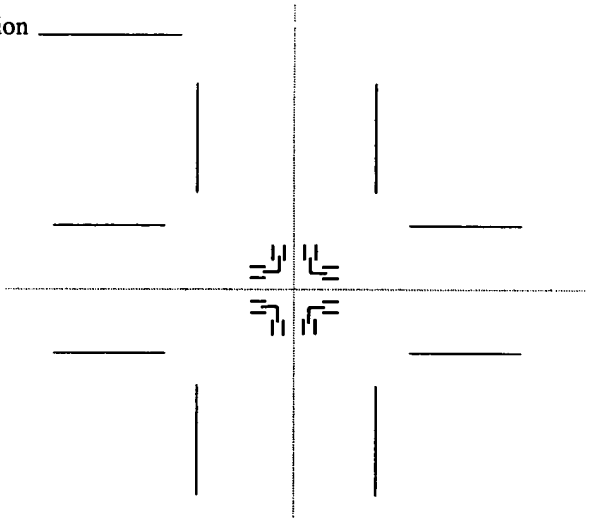




Location 2



Location _____



Rockwell Science Center InP HBT PROCESS LOT FOLLOWER 6WAFERS Charge # 35016 – 87258-0000

Collector Contact	Step	Date/ Oper.	Tools	Step operation	Operation recipe	Notes
~~Wafer clean~~ ~~Close Couple with PR~~	0.1		Wet station	Dip, dry	~~NH4OH (2%), 30sec, DI rinse, 30sec, N2 blow dry~~	
HMDS Dep	1	5/11 RA	~~YES~~ Oven	HMDS Dep	Program 0	
Apply resist/bake (target 2.5um)	2	5/11 RA	Solitec Coat	Resist type Spin resist Hotplate bake	511 ~~2000~~ RPM ~~60~~ sec 4000 RPM 30SEC 110C, 60sec	
Expose Device Mask	**5**	~~5/11~~ 5/11 RA	GCA Stepper	Mask / Reticle name Global align to DFAS align to Vernier align to Job name\ pass	ROC1 / Layer 7 B 1 1 1 .5 MAP ROC11-3/1917	
Image Reversal Bake	5.1	5/11	YES Oven	Ammonia Program:	3	
Flood	5.2	5/11 RA	Flood Unit	Dose	~~300~~ mj	
Develop	**6**	5/14 RA	Solitec DEV.	Develop Type: Develop Time:	701 60 Sec.	
Inspect wafers	7	5/14 RA	Optical scope	View wafers	**Equipment type A O Microscope** ◊ **Check for patterns properly developed** ◊ **Check alignment (+/- 0.25um)** ◊ **Smallest Resolution Pattern Read** 1 (µm) **Acceptance : Yes___ , No___**	X = .1 Y = 0 5/14 5-6 02 Doscan Ramgen Lamm
Pre-metal surface prep ~~(not needed if metal is closed coupled with etch)~~	0.8		Wet bench	Dip Rinse, dry	HCl, 20% + 4 drops tergitol 30sec DI, 15sec, N2 blow dry	
Metal deposition	0.9	5/16/0 KS	CRYO evaporator	Metal dep Ti/Pt/Au/Ti Metal dep check	150 / 200 / 5000 / 30 Record film thicknesses from crystal monitor 3" 111 #46	
Liftoff	0.10	5/15 01	Wet bench	Liftoff Rinse Dry Clean backside	Acetone soak, >10min IPA soak, 1min N2 blow Scrape flakes off backside with razor blade If needed	1-0
Inspect wafers	0.11	5.15	Optical scope	Inspect wafers	Metal appearance good	1-2

Attachment 3
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Lot #: Rec 1-4 Wafer #: 025 Layer #: 7

Location 1

0 0

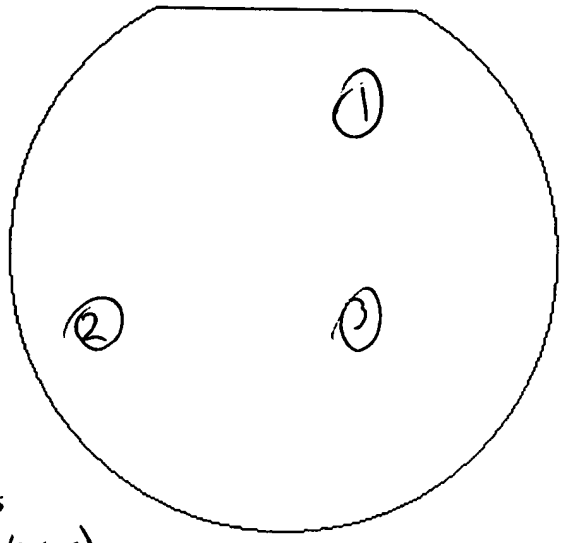
←.1 ←.05

Resolution ok Resolution Ok

←.1 ←.1

↓.1 ↓.1

Resolution OK Resolution Poor Focus (also previous layers)



Location 2

↑.1 ↑.1

←.1 ←.05

Resolution ok Resolution OK

←.1 ←.05

↑.1 ↑.1

Resolution OK Resolution OK

AVG. X .07

AVG. Y .075

☐ Rework

☒ Accept

Initial SMN

Location 3

↑.1 ↑.1

←.1 0

Resolution ok Resolution OK

←.1 0

↑.05 0

Resolution OK Resolution OK

SMN 5/8/01

Lot #: ROC1-4 Wafer #: 022 Layer #: 7

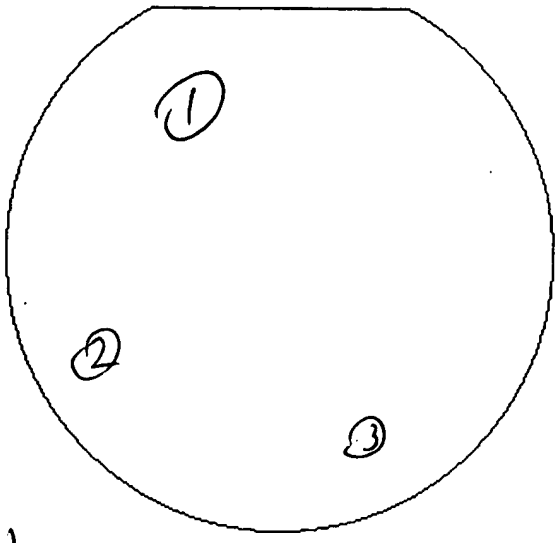
Location 1

0 .1 .1 .1

Resolution ok Resolution ok

.1 0 .1 .1

Resolution ok Resolution Poor Focus (All Layers)



Location 2

.1 .15 .2 .1

Resolution ok Resolution ok

.1 .1 .1 .1

Resolution ok Resolution ok

AVG. X .09
AVG. Y .11

☐ Rework
☒ Accept

Initial SMN

Location 3

.15 .2 .1 0

Resolution ok Resolution Poor Focus (all layers)

.1 .1 .1 .15

Resolution ok Resolution ok

SMN 5/8/01

Lot #: ROC1-4 Wafer #: 027 Layer #: 7

Location C

.1 .15

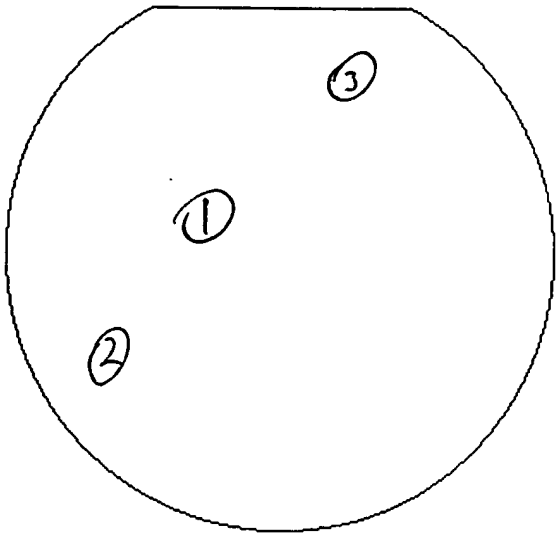
0 0

Resolution OK Resolution OK

.1 .1

.05 .1

Resolution OK Resolution OK



Location 2

.15 .1

.1 .15

Resolution OK Resolution OK (Poor focus All other Layers)

.1 .1

.1 .15

Resolution OK Resolution Poor Focus (all layers)

AVG. X .1
AVG. Y .83

☐ Rework
☒ Accept

Initial SMN

Location 3

.1 0

0 .1

Resolution OK Resolution OK

.1 .15

.1 0

Resolution Poor focus (Full Layers) Resolution Poor Focus (all Layers)

SMN 5/8/01

Lot #: ROC14 Wafer #: 021 Layer #: 7

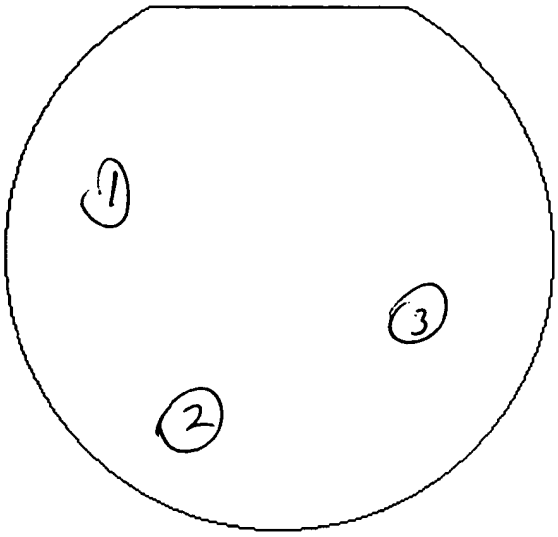
Location 1

.1 ↑ ← .15 Resolution OK

.1 ↑ ← .1 Resolution OK

.1 ← 0 Resolution OK

.1 ← 0 Resolution OK



Location 2

.1 ↑ ← .1 Resolution Poor Focus (all layers)

.1 ↑ ← .1 Resolution Poor Focus (all layers)

.1 ← .1 Resolution OK

.1 ← .15 Resolution OK

AVG. X .1

AVG. Y .58

☐ Rework

☑ Accept

Initial Smq

Location 3

0 ← .1 Resolution OK

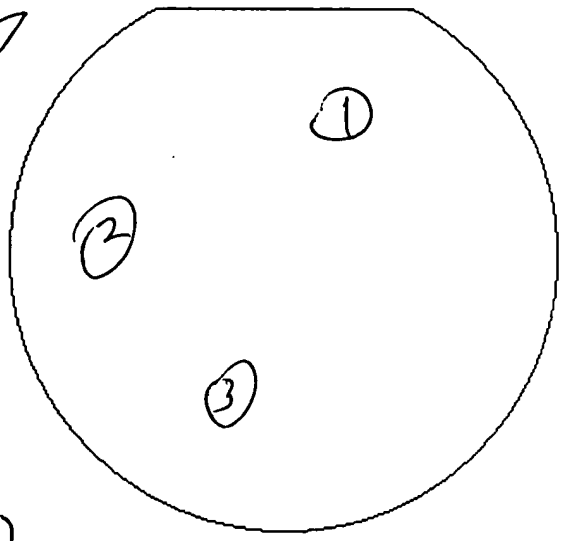
.1 ↑ 0 Resolution OK

0 ← .15 Resolution OK

0 ← .1 Resolution OK

SMN 5/8/01

Lot #: Roc1-4 Wafer #: No # Layer #: 7



Location 1

.1 0

0 .05

Resolution OK Resolution OK

? .1

.10

Resolution Poor Focus (really bad, other layers) Resolution Poor Focus (all layers)

Location 2

.1 .1

.15 .1

Resolution OK Resolution OK

.15 .15

.1 .1

Resolution OK Resolution Poor Focus (all layers)

AVG. X .1
AVG. Y .1

☐ Rework
☑ Accept

Initial SMN

Location 3

.1 .15

.1 .1

Resolution Poor Focus (all layers) Resolution Poor Focus (all layers)

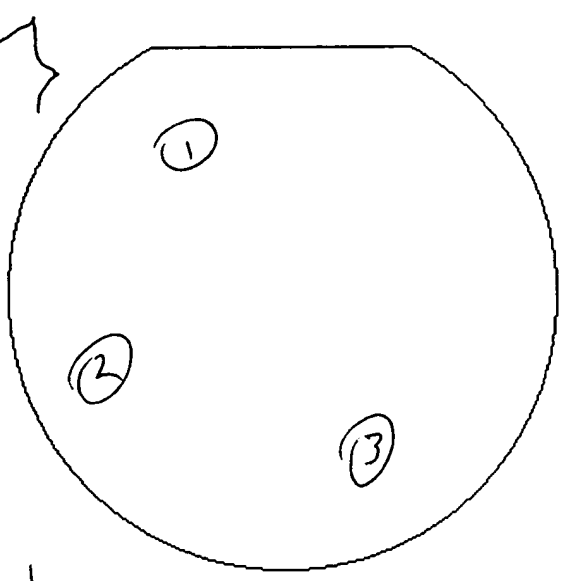
.15 .05

.1 .1

Resolution OK Resolution OK

SMN 5/8/01

Lot #: ROC 1-4 Wafer #: No # Layer #: 7



Location 1

↑ .1 | 0

← .05 ← .18

Resolution OK | Resolution OK

← .1 ← .15

0 | ↑ .1

Resolution Bad Focus (all layers) | Resolution Bad Focus (all layers)

Location 2

↑ .1 | 0

← .1 ← .1

Resolution OK | Resolution Poor Focus (all layers)

← .1 ← .1

↑ .1 | ↑ .15

Resolution OK | Resolution OK

AVG. X .108
AVG. Y .067

☐ Rework
☑ Accept

Initial SMN

Location 3

↓ .1 | ↑ .1

← .1 ← .1

Resolution Bad Focus (all) | Resolution Poor Focus (all)

← .15 ← .1

0 | ↓ .05

Resolution OK | Resolution OK

SMN 5/8/01

Rockwell Science Center

InP HBT PROCESS LOT FOLLOWER (6 WFRS)

Charge # 35016 – 87258-0000

Isolation Etch	Step	Date/ Oper.	Tools	Step operation	Operation recipe	Notes
Wafer clean	0.1	5-15	Wet station	Dip, dry	NH4OH (2%), 30sec, DI rinse, 30sec, N2 blow dry	
HMDS Dep	1	5-15 ER	YES Oven	HMDS Dep	Program 0 ✓	
Apply resist/bake (target 2.5 um)	2	5-15 ER	Solitec Coat	Resist type Spin resist Hotplate bake	511 ✓ 4000 RPM (3000) 30 sec. ✓ 110C, 60sec ✓	
Expose Device Mask	5	5-15 PM	GCA Stepper	Mask / Reticle name Global align to DFAS align to Vernier align to Job name\ pass	ROC1 / Layer 2 1 1 1 MAP ROC1·3\M\12	.6
Develop	6	5-15 PM	Solitec DEV.	Develop Type: Develop Time:	701 60 Sec..	
Inspect wafers	7	5-15 PM	Optical scope	View wafers	Equipment type A O Microscope ◊ Check for patterns properly developed ◊ Check alignment (+/- 0.25µm) ◊ Smallest Resolution Pattern Read 1 (µm) Acceptance : Yes___ , No___ X = 0 Y = 0 ±1 OVERALL	X X X
Post Bake	RLP	5/16	Ovens in Lab 335	Post bake PR	90C 30min	
Descum	0.7	A.L. 5/16	Branson 1	Descum	O2, 500mT, 300W, 4min	
Isolation Etch	0.8	A.L. 5/16	Wet bench	MAGIC ETCH		
PR strip	0.10	A. L. 5/16	Wet bench	Strip Resist Rinse Dry	Acetone soak, 10min IPA soak, 1min N2 blow	
Inspect wafers	0.11	A. L. 5/16	Optical scope	View wafers		

Attachment 3
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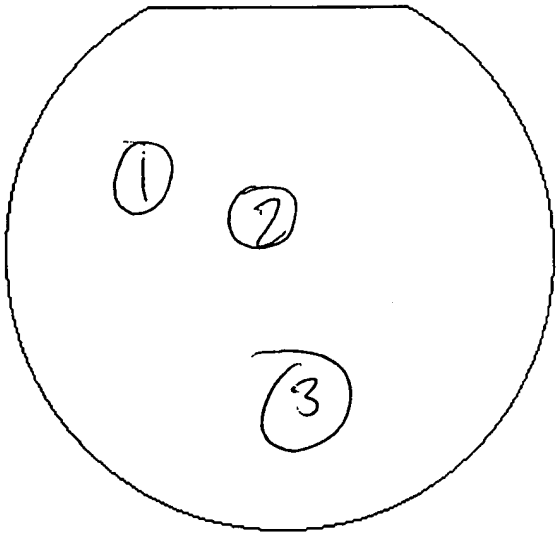
Lot #: ~~MS2-C12~~ ROC1-4 Wafer #: 21 Layer #: ~~2 (Cu1A)~~ ←

Location ①

Resolution ____ Resolution ____

Resolution ____ Resolution ____



Location ②

Resolution ____ Resolution ____

Resolution ____ Resolution ____

AVG. X ← .1
AVG. Y ↑ .15

☐ Rework
☑ Accept

Initial HP

Location ____

Resolution Poor Resolution Poor

Resolution ____ Resolution ____

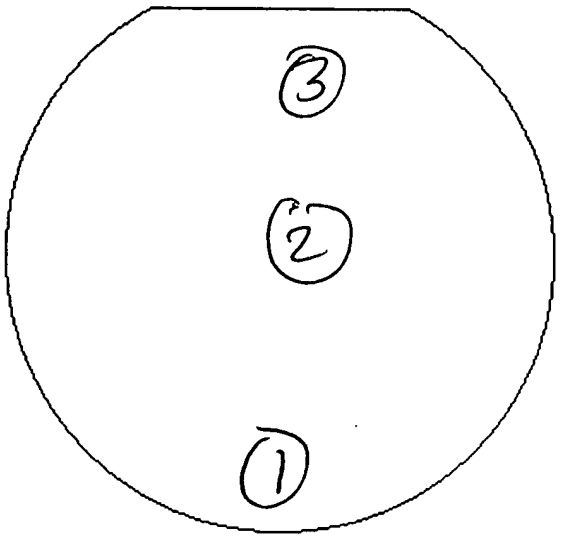
SMN 5/8/01

Lot #: Roc1-4 Wafer #: 27 Layer #: 2

Location (1)

Resolution _____ Resolution _____

Resolution Poor Axe Resolution _____



Location (2)

Resolution _____ Resolution _____

Resolution _____ Resolution _____

Location (3)

Resolution _____ Resolution _____

Resolution _____ Resolution _____

AVG. X .1

AVG. Y .1

☐ Rework

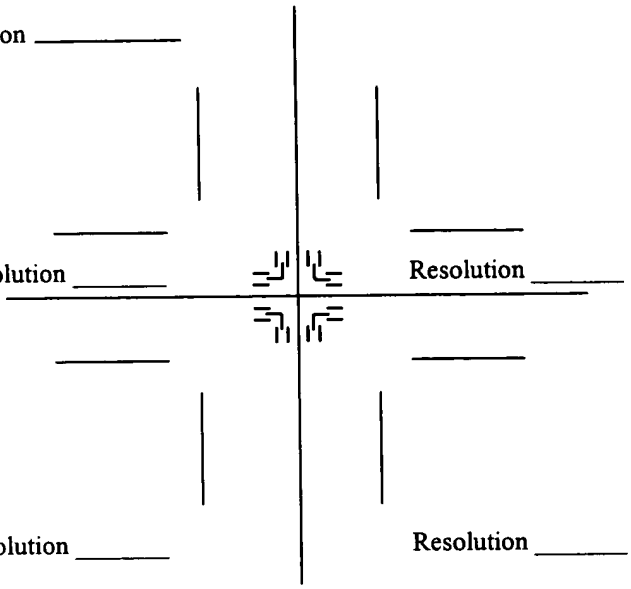
☑ Accept

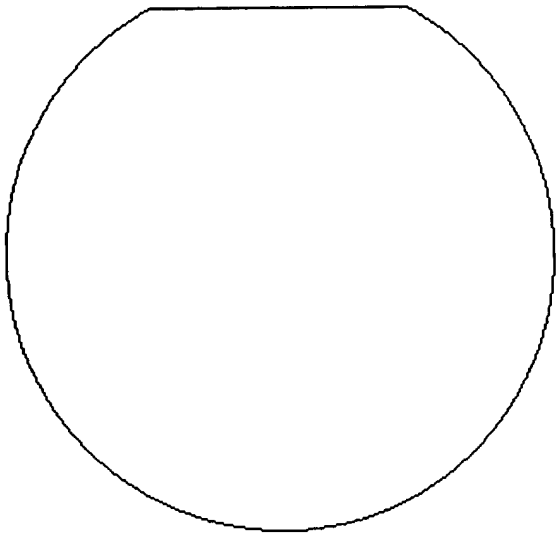
Initial _____

SMN 5/8/01

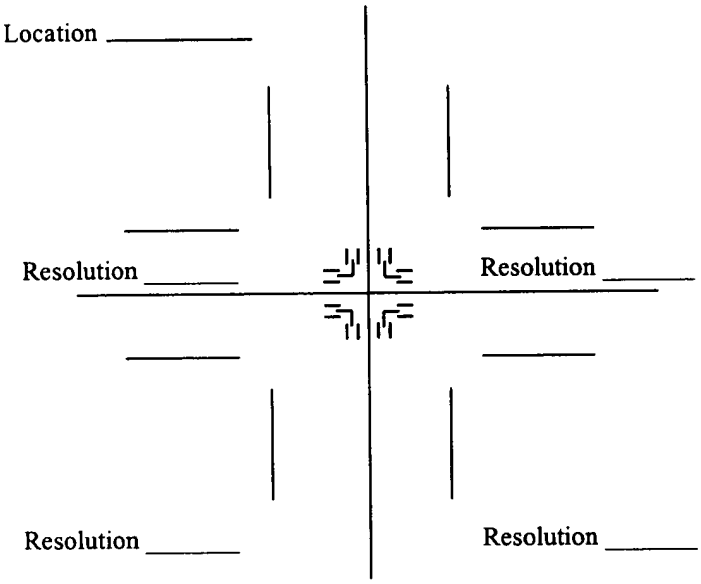
Lot #: _____ Wafer #: _____ Layer #: _____

Location _____





Location _____



AVG. X_____

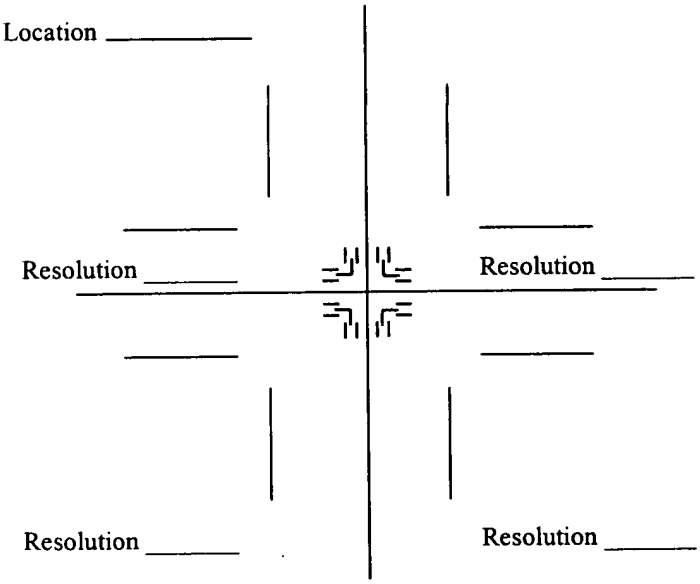
AVG. Y _____

☐ Rework

☐ Accept

Initial_____

Location _____



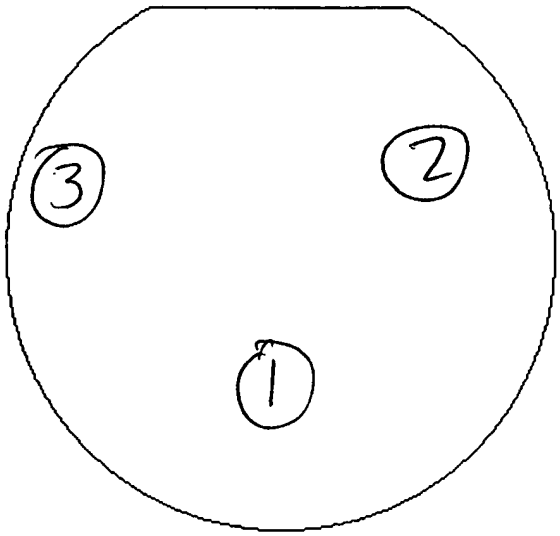
SMN 5/8/01

Lot #: Roc1-4 Wafer #: 22 Layer #: 2

Location (1)

Resolution ____ Resolution ____

Resolution ____ Resolution ____



Location (2)

Resolution ____ Resolution ____

Resolution ____ Resolution ____

AVG. X ← .1
AVG. Y ↑ .05

☐ Rework
☑ Accept

Initial ____

Location (3)

Resolution ____ Resolution ____ overall

Resolution ____ Resolution ____

SMN 5/8/01

Lot #: Roc1-4 Wafer #: 25 Layer #: L2

Location (1)

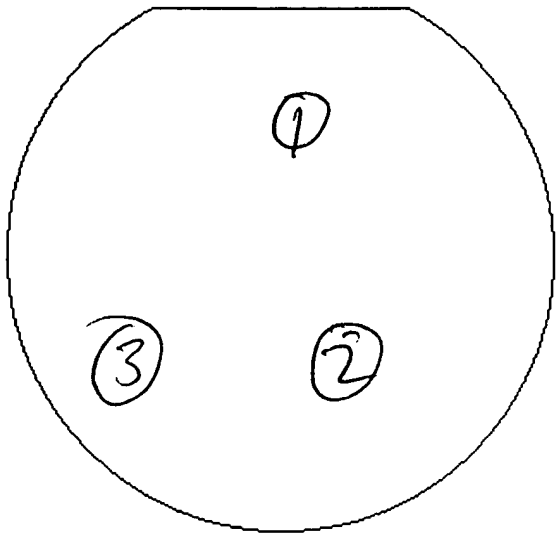
Resolution .2

Resolution .15

Resolution .15

Resolution .1

Resolution Poor Both



Location (2)

Resolution .05

Resolution .05

Resolution .15

Resolution .5

.1

Resolution

Resolution

AVG. X Ø

AVG. Y .1

☐ Rework

☑ Accept

Initial KP

Location

Resolution .1

Resolution .1

Resolution .15

Resolution .15

Resolution

Resolution

SMN 5/8/01

Lot #: ROC1-4 Wafer #: NO NUM Layer #: 2

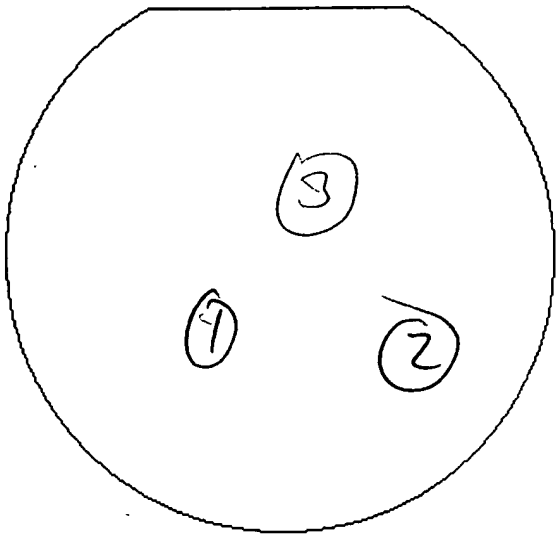
Location (1)

Resolution OK

Resolution OK

Resolution OK

Resolution



Location (2)

Resolution

Resolution

Resolution

Resolution

AVG. X Ø
AVG. Y ← .15

☐ Rework
☑ Accept

Initial VP

Res over exposed a bit

Location (3)

Resolution

Resolution

Resolution Poor Both

Resolution

SMN 5/8/01

InP HBT PROCESS LOT FOLLOWER

Wafer 025 Step Isolation Charge # 35016 – 87258-0000 Lot # Roc1-4a

Etch Time	Etchant	Ref THK	DEKTAK	Etch Amount	Etch Rate
	~~HCl~~	10890			
124 sec	~~In6~~ 1:8:160		15,210	4,330 Å	

Comments and Pictures:

Subcollector: 50 Å InP
4000 InGaAs

InP HBT PROCESS LOT FOLLOWER

Wafer 022 Step Isolation Charge # 35016 – 87258-0000 Lot # RoC1-4a

Etch Time	Etchant	Ref THK	DEKTAK	Etch Amount	Etch Rate
10sec	1:8:160	10,780			
25sec	HCl		18970		

Comments and Pictures:

approximate subcollector thickness: 200
thickness etched in base pad : 0
target thickness : 20C
+ 3800 InP for H

Wafer 21 DHBT

InP HBT PROCESS LOT FOLLOWER

Step Isolation

Charge # 35016 – 87258-0000

Lot # ROC1-4A

Etch Time	Etchant	Ref THK	DEKTAK	Etch Amount	Etch Rate
13 sec	1:8:160	≈10,830			
15 sec	HCl		16,010	5180	

Comments and Pictures:

200Å InGaAs

3800Å InP

Wafer 27 S+IBT InP HBT PROCESS LOT FOLLOWER Charge # 35016 - 87258-0000

Step Isolation Lot # ROC1-4a

Etch Time	Etchant	Ref THK	DEKTAK	Etch Amount	Etch Rate
	~~[illegible]~~	≈10,830			
125 sec	1:8:160		15,430	4600	

Comments and Pictures:

~~500Å InP~~

4000Å InGaAs

Wafer B3B4 & B3B3 InP HBT PROCESS LOT FOLLOWER Charge # 35016 – 87258-0000

D+HBT Step Isolation Lot # ROC1-4A

Etch Time	Etchant	Ref THK	DEKTAK	Etch Amount	Etch Rate
#1 10sec	1:8:160	≈ 10,830			
15sec	HCl		14,300	Total = 3470	
add 6sec	HCl		14,475		
#2 10sec	1:8:160	10,830			
15sec	HCl		13,600	Total = 2770	
add 15sec	HCl		15,355		

Comments and Pictures:

200 InGaAs
3800 InP

Rockwell Science Center InP HBT PROCESS LOT FOLLOWER Charge # 35016 – 87258-0000

BCB SPIN	Wafers in	Wafers Out	Tools	Step operation	Operation recipe	Operator/ Dat
ADD 3" M chanical Test Wafer.						
Wafer Clean	6	6	Wet Station	Dip Rinse Dry	: NH4OH 2 % 15 sec : DI Dump Rinse : Spin Dryer	5/25
BCB Adhesion promoter	6+1	6+1	Headway Resist Coater	Promoter type Spin Promoter	APS 3000 500rpm, 10s + 1500rpm, 20s	
BCB Dep	6+1	6+1	Headway Resist Coater	BCB type Spin BCB Hot Plate Bake	DOW 3022-35 (Must be at room temp.) 500 rpm, 10s + 1500rpm, 20s 70C 90sec	
BCB Bake	6+1	6+1	Oven in Rm307	Bake 100C Ramp 210C Bake 210C	15min No greater than 10C/min 180 min	
Planarization etch back	6+1	6+1	UnAxis 790	790 etch Parameters CHF3 : 40 Scem 40W O2 : 10 Scem 100W	HBT_BCB2 6000Å Time 22:30 Etch Rate: 4.4Å/Sec	5/29
Inspect wafers	6+1	6+1	Optical scope	View wafers	Equipment type A O Microscope ◊ ~~Check for patterns BCB is clear.~~ Acceptance : Yes___ , No___ Ellipsometer reading: _____	5/29

Attachment 3
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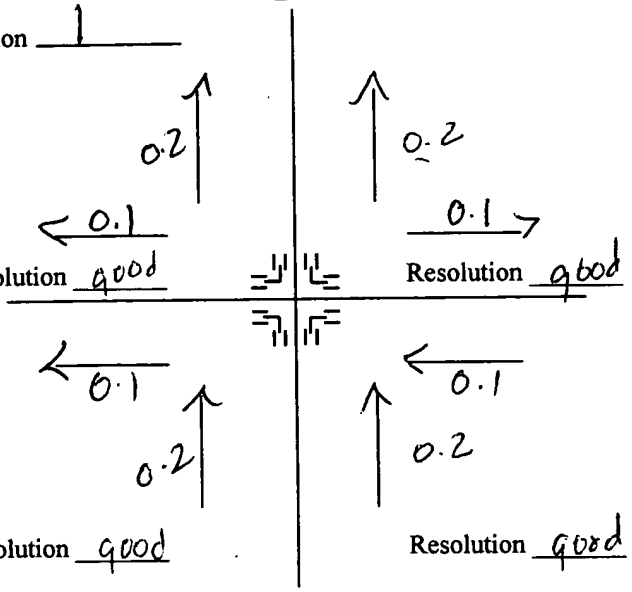
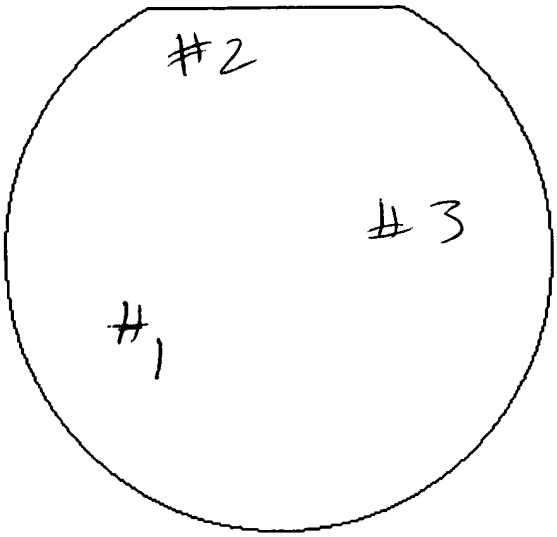
Judi – I forgot about the mechanical wafer again. Please ask Scott for one or find me.
– Amal
test wafer added.

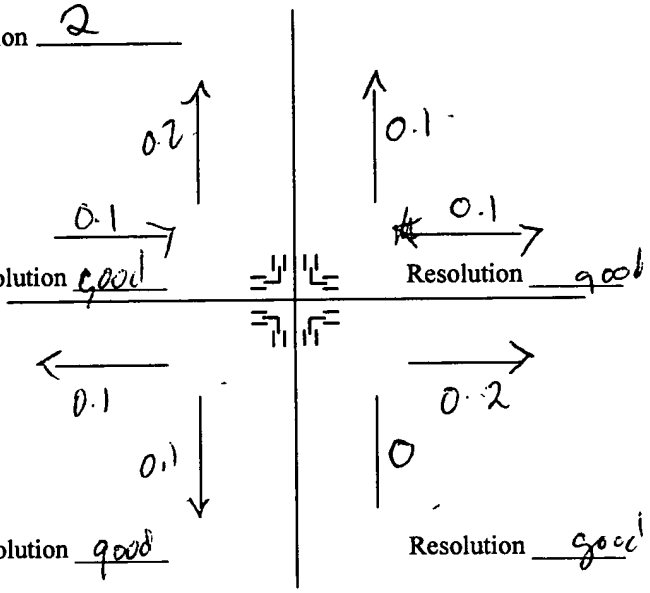
Lot #: Roc1 Wt4A Wafer #: 22 Layer #: 26

Location 1





Location 2

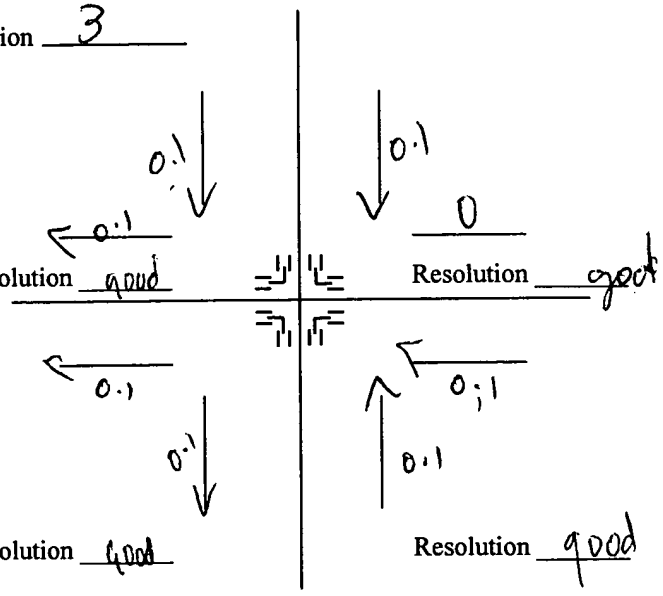


AVG. X 0.2
AVG. Y 0.1

☐ Rework
☑ Accept

Initial JVL

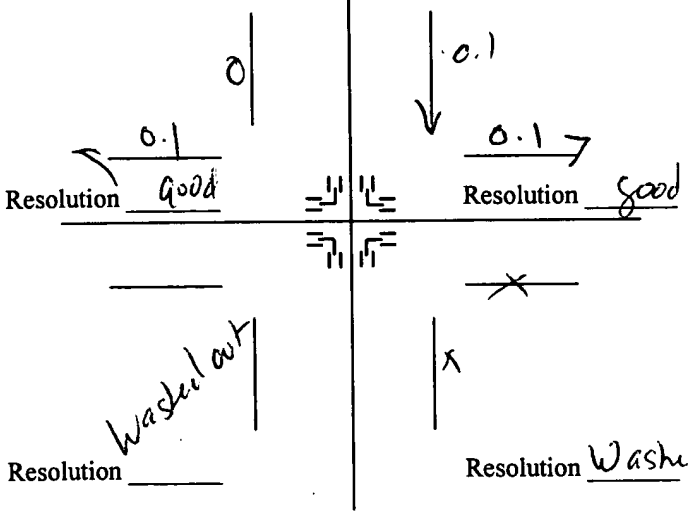
Location 3

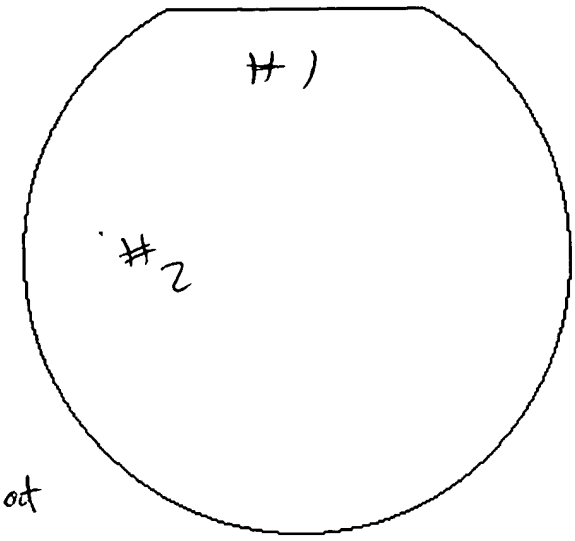


SMN 5/8/01

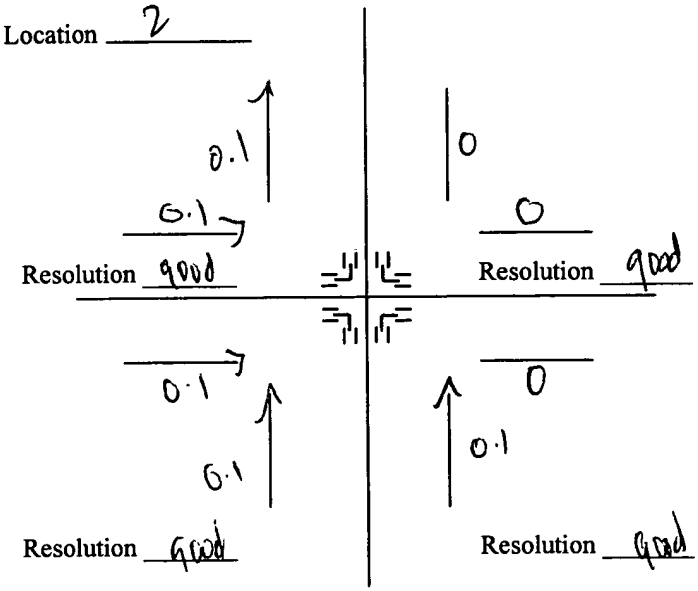
Lot #: Rel 14A Wafer #: ? Layer #: 26

Location 1





Location 2

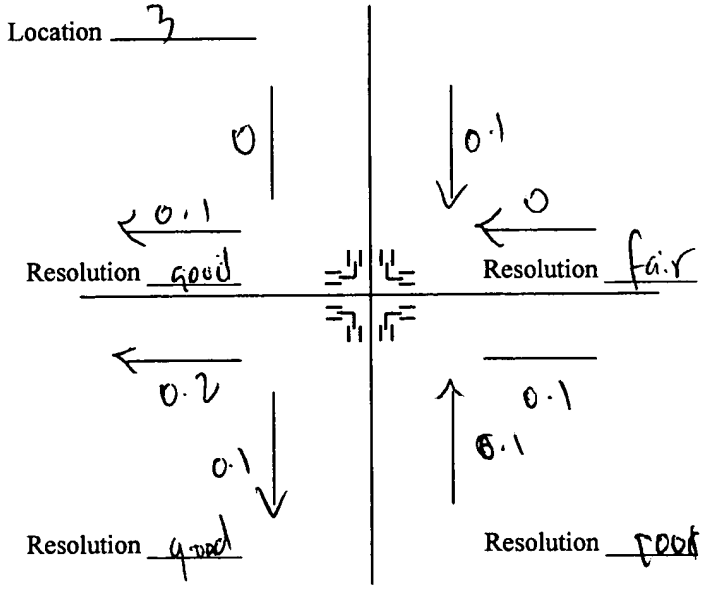


AVG. X 0.1
AVG. Y 0.1

☐ Rework
☒ Accept

Initial JVd.

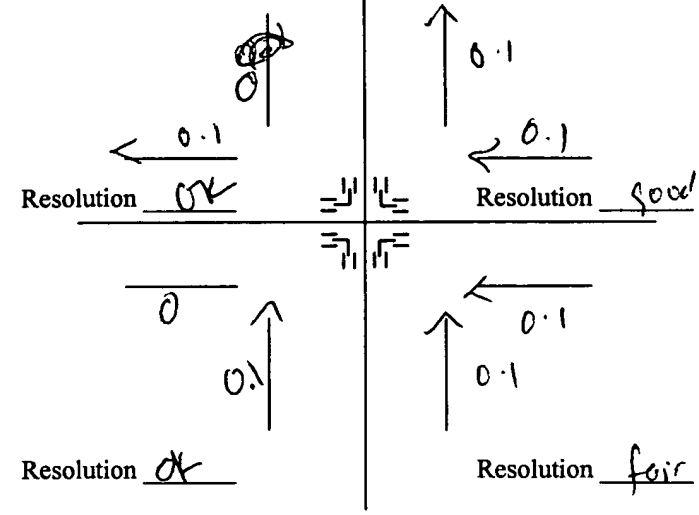
Location 3

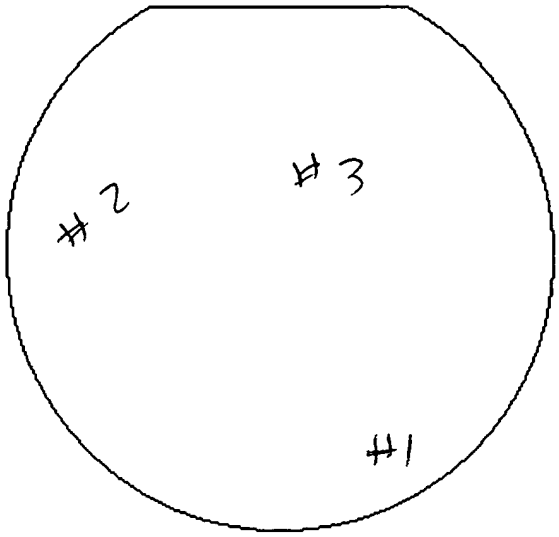


SMN 5/8/01

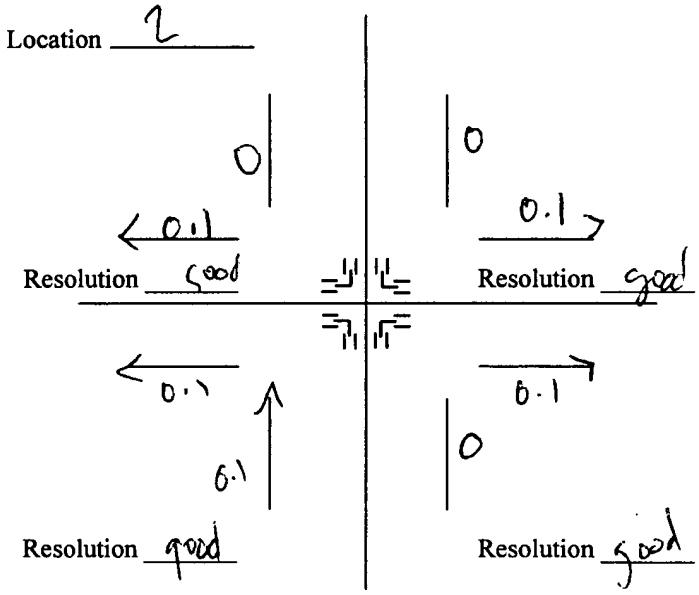
Lot #: Poc1 L4A Wafer #: 7 Layer #: 26

Location 1





Location 2

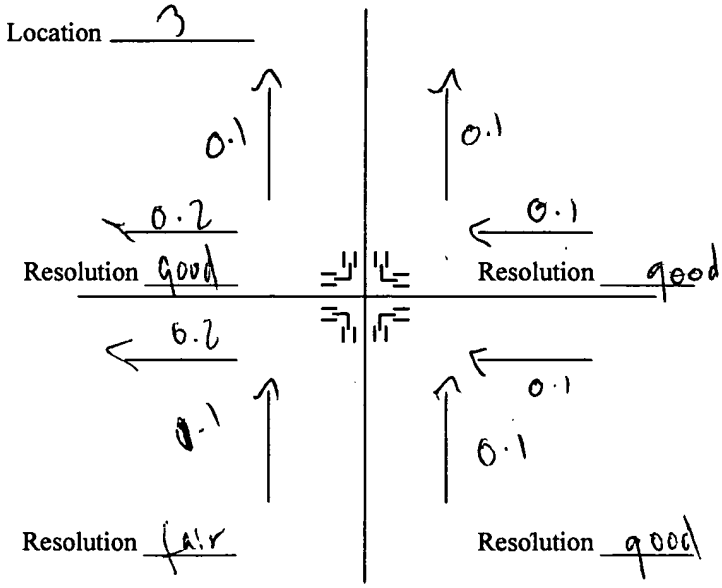


AVG. X .1
AVG. Y .1

☐ Rework
☒ Accept

Initial ud

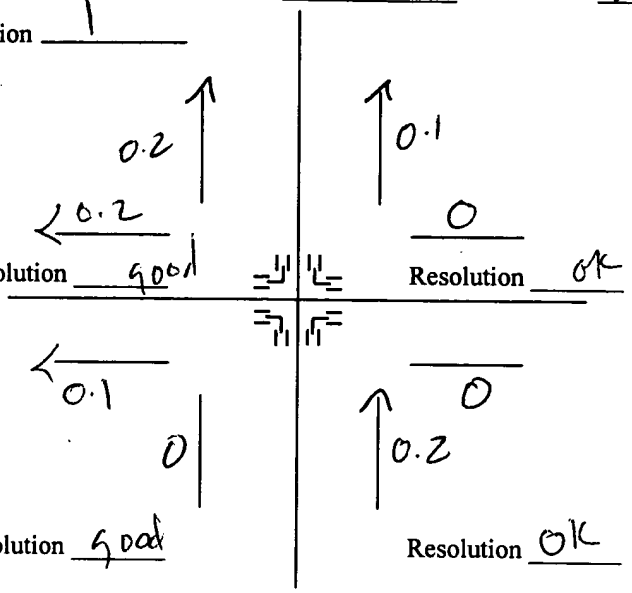
Location 3

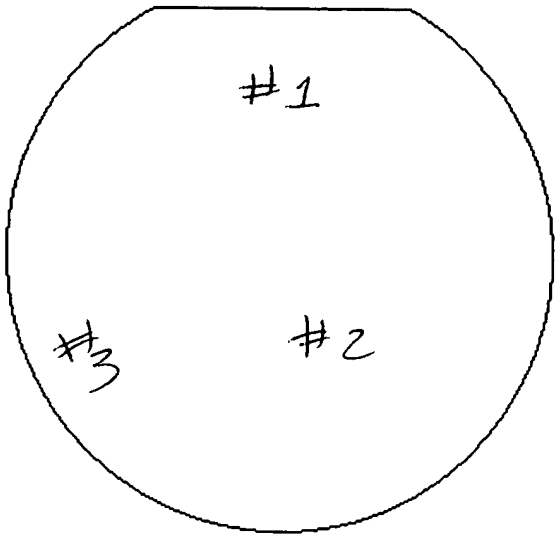


SMN 5/8/01

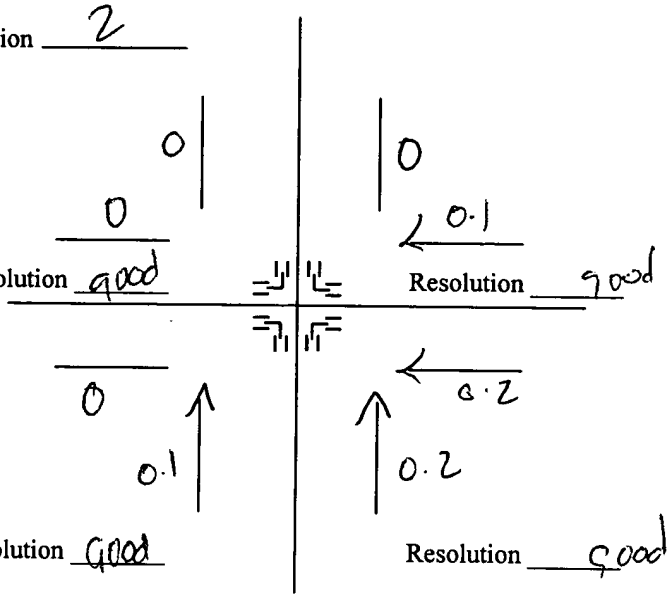
Lot #: ROC.1L4A Wafer #: 27 Layer #: 26

Location 1





Location 2

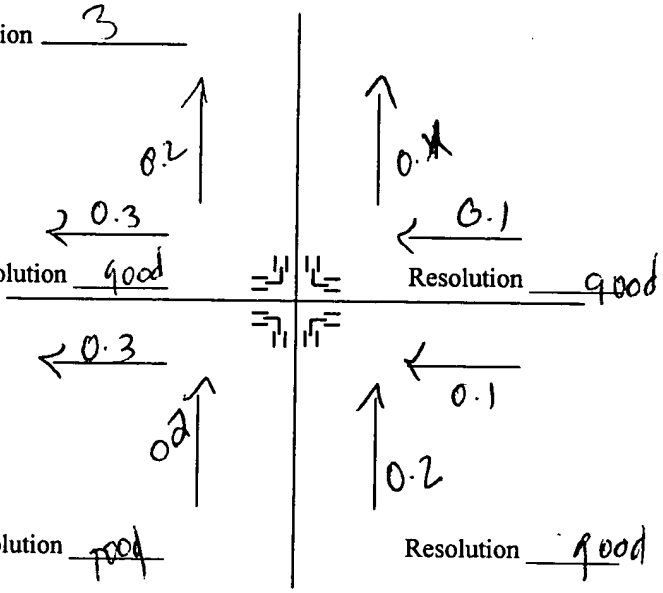


AVG. X 0.2
AVG. Y 0.1

☐ Rework
☑ Accept

Initial

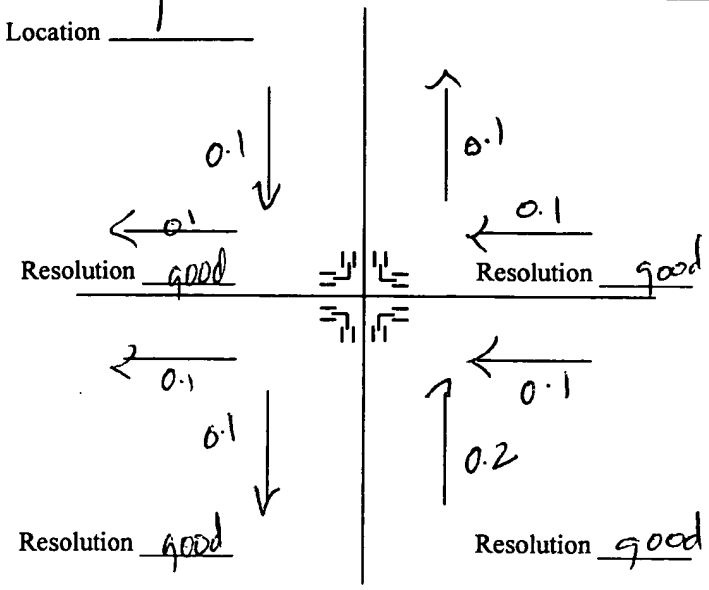
Location 3

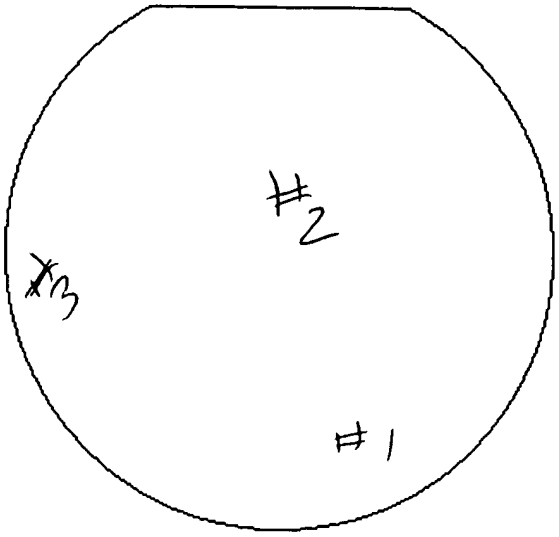


SMN 5/8/01

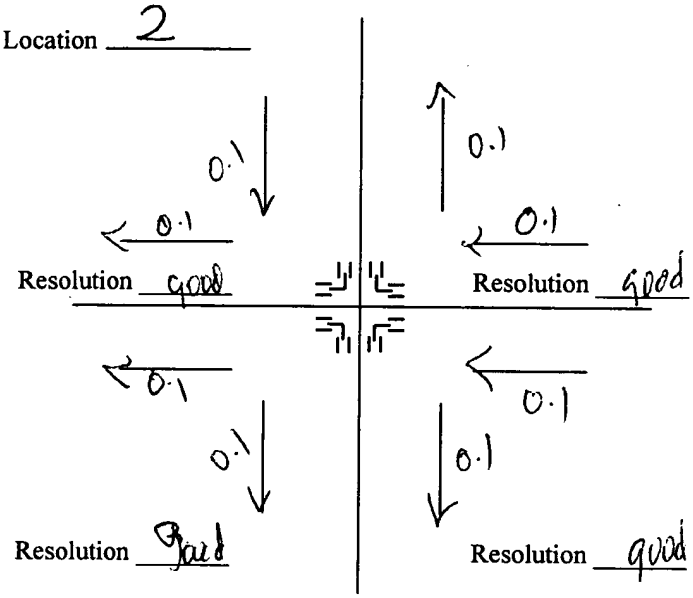
Lot #: Rod Lot4A Wafer #: 21 Layer #: 26

Location 1





Location 2

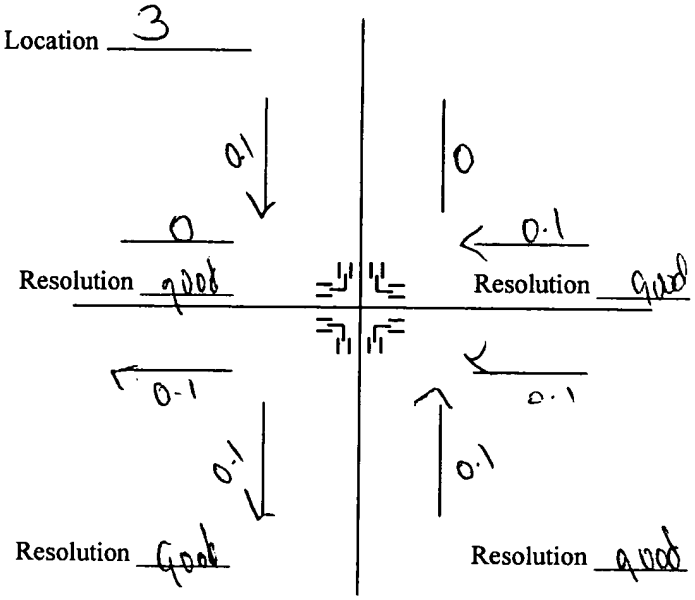


AVG. X .1
AVG. Y .1

☐ Rework
☑ Accept

Initial JA

Location 3



SMN 5/8/01

Lot #: Boc 14A Wafer #: _____ Layer #: 26

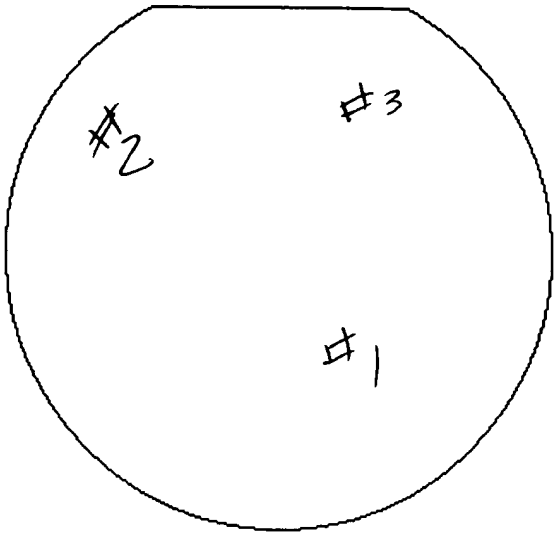
Location 1

0.1 | 0 | 0.1 | 0

Resolution OK | Resolution good

0.1 | 0.1 | 0 | 0

Resolution good | Resolution good



Location 2

0.1 | 0 | 0.1 | 0

Resolution good | Resolution good

0 | 0 | 0.1 | 0.5

Resolution good | Resolution Overexposed

AVG. X 0.1
AVG. Y 0.0

☐ Rework
☒ Accept

Initial AJ jvd

Location 3

0 | 0 | 0.1 | 0

Resolution good | Resolution good

0.1 | 0 | 0 | 0.1

Resolution good | Resolution overexposed

SMN 5/8/01

Rockwell Science Center

InP HBT PROCESS LOT FOLLOWER

Charge # 35016 – 87258-0000

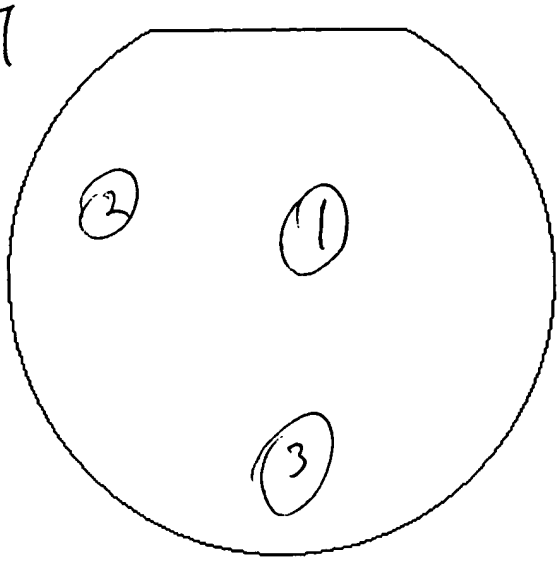
+1 4" Test

BCB Base Via Etch	Wafers In	Wafers Out	Tools	Step operation	Operation recipe	Operat r/ Date
HMDS Dep	6 +1		YES Oven	HMDS Dep	Program 0 ✓	5-30 PH
Apply resist/bake	7	7	Solitec Coat	Resist type 4000 RPM - 30 SEC	511 ✓ HOTPLATE 110C - 60 SEC	5-30 ER
Expose Device Mask	7	7	GCA Stepper	Mask / Reticle name Global align to DFAS align to Vernier align to Job name\ pass	ROC1 / **Layer 26** 1 1 1 .6 MAP ROC11.4\M,26	5-30 R
Develop	7	7	Solitec DEV.	Develop Type: Develop Time:	701 ✓ 60 Sec. ✓	5-30 ER
Inspect wafers	7	7	Optical scope	View wafers	Equipment type A O Microscope ✓ Check for patterns properly developed ✓ Check alignment (+/- 0.2µm) .1 OVERALL ✓ Smallest Resolution Pattern Read .7 (µm) Acceptance : Yes ✓ , No	5-30 ER
Etch Rate	7	7	Unaxis 790 Dektak/Ellipsometer	Program: Time:	HBT_BCB 15 min @ 9600 THK(A) + 30% over etch 1067 A/s	5/31 Sm
BCB Via Etch	6	6	Unaxis 790	Program : Time:	HBT_BCB ~ 7400 + overetch 15 min	5/31 Sm
Inspection	6	6	Optical scope	View wafers		5/31 Sm
PR Descum Etch	6	6	~~Unaxis 790~~ Branson	Program	HBT_PR 5:5	5/31 Sm
PR strip	6	6	Wet bench	Strip Resist Rinse Dry	Acetone soak, 10min IPA soak, 1min N2 blow	5/31 Sm
Inspect wafers	6	6	Optical scope	View wafers		5/31 Sm

Lot #: ROC1-4 Wafer #: No # Layer #: 25

Location 1

↑ .1	↑ .1
← .3	0
Resolution OK	Resolution Good
← 3	← .1
↑ .2	0
Resolution OK	Resolution Fair



Location 2

↑ .35	↑ .2
← .1	← .05
Resolution OK	Resolution Fair
← .15	← .05
↑ .25	↓ .1
Resolution Fair	Resolution Good

AVG. X .2
AVG. Y .2

☐ Rework
☒ Accept

Initial Soft

Location 3

↓ .35	↑ .1
← .2	← .1
Resolution Fair	Resolution Fair
← .25	← .25
↓ .05	0
Resolution Good	Resolution Good

SMN 5/8/01

Lot #: ROC1-4 Wafer #: 27 Layer #: 25

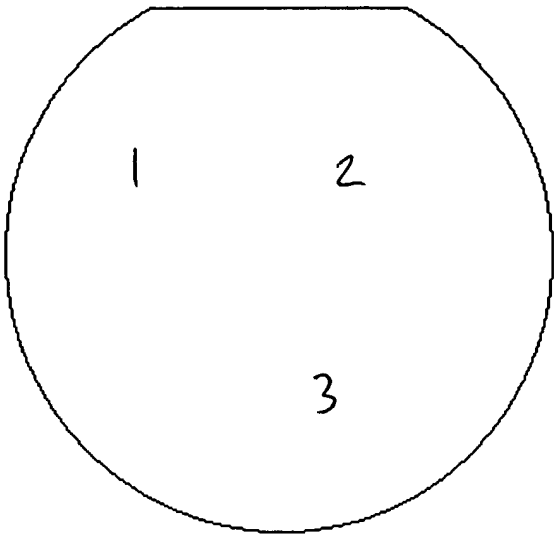
Location 1

.3 ← .1 — Resolution OK

.15 ← 0 — Resolution OK

.1 ← .1 — Resolution Fair

.2 ← 0 — Resolution Fair



Location 2

.2 ← .25 — Resolution OK

.1 ← .05 — Resolution OK

.2 ← .2 — Resolution Good

.05 ← 0 — Resolution OK

.1 ← .1

AVG. X .2
AVG. Y .15

☐ Rework
☒ Accept

Initial SMN

Location

.1 ← .3 — Resolution Bad

.25 ← .25 — Resolution OK

.15 ← .3 — Resolution Fair

.15 ← .15 — Resolution Good

0

SMN 5/8/01

Rockwell Science Center

InP HBT PROCESS LOT FOLLOWER

Charge # 35016 – 87258-0000

(6 WFRS)

BCB C llect r Via Etch	Wafers In	Wafers Out	Tools	Step operation	Operation recipe	Operator/ Date
HMDS Dep	6	6	YES Oven	HMDS Dep	Program 0 ✓	6-1-01 PH
Apply resist/bake	6	6	Solitec Coat	Resist type 3500 RPM - 30 SEC	518 ✓ HOTPLATE 110C - 60 SEC	6-1-01 ER
Expose Device Mask	6	6	GCA Stepper	Mask / Reticle name Global align to DFAS align to Vernier align to Job name\ pass	ROC1 / **Layer 25** 1 1 1 MAP ROC11.4\M,25 EXP .85	RM
Develop	6	6	Solitec DEV.	Develop Type: Develop Time:	701 60 Sec..	6/3
Inspect wafers	6	6	Optical scope	View wafers	Equipment type A O Microscope ◊ Check for patterns properly developed ◊ Check alignment **(+/- 0.35µm)** ◊ Smallest Resolution Pattern Read -8 (µm) Acceptance : Yes ___ , No ___	X = .1 Y = .1 CB
Etch Rate	6	6	Unaxis 790 Dektak/Ellipsometer	Program: Time:	HBT_BCB 65 min 8850 THK(A) 983 A/s	6/5
BCB Via Etch	6	6	Uniaxis 790	Program : Time:	HBT_BCB 23	6/5
Inspection	6	1	Optical scope	View wafers		6/5
PR strip	6	1	Wet bench	Strip Resist Rinse Dry	Acetone soak, 10min IPA soak, 1min N2 blow	6/5
Inspect wafers	6	6	Optical scope	View wafers		6/5

Attachment 3
Page 54 of 68

Lot #: ROC 1-4 Wafer #: 25 Layer #: 25

Location 1

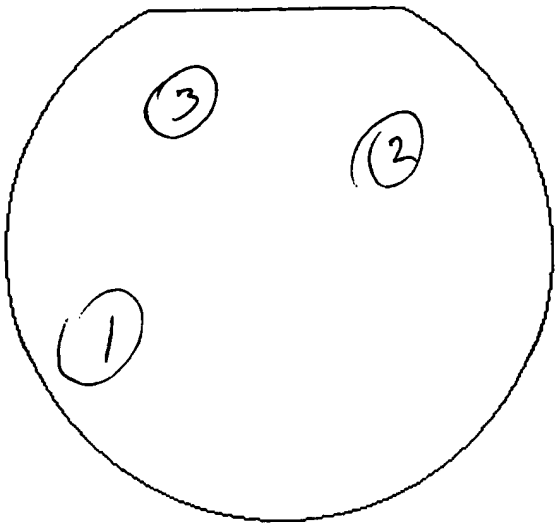
↑ .05 | ↑ 0

← .1 Resolution Good | Resolution Good 0 →

← .1 | 0 →

↑ .1 | ↓ 0

Resolution Good | Resolution Fair



Location 2

↑ .1 | ↑ .1

← 1 Resolution Good | Resolution OK 0 →

← 2 | ← .05

↓ .15 | ↓ .05

Resolution Good | Resolution Good

AVG. X ← 0.1

AVG. Y 0.1 ↑

☐ Rework

☒ Accept

Initial JAL S.N.

Location 3

↑ .1 | ↑ .1

← .2 Resolution Good | Resolution Good ← .1

← .2 | ← .1

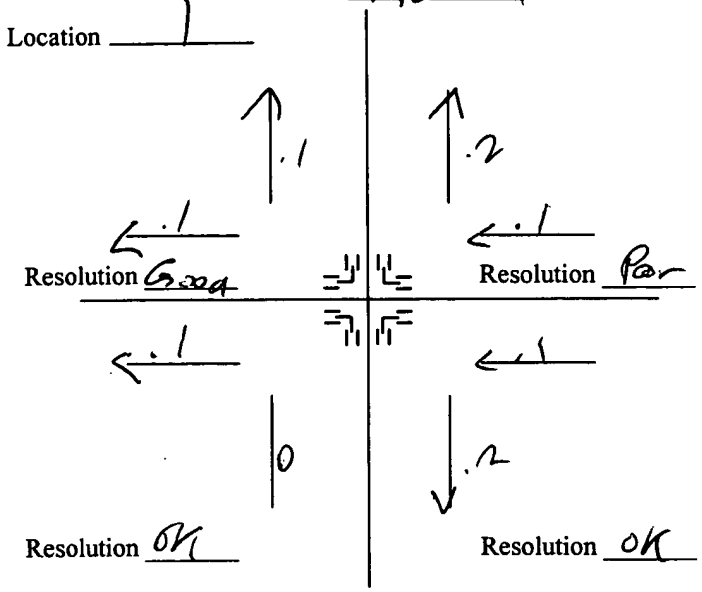
↑ .1 | ↑ .1

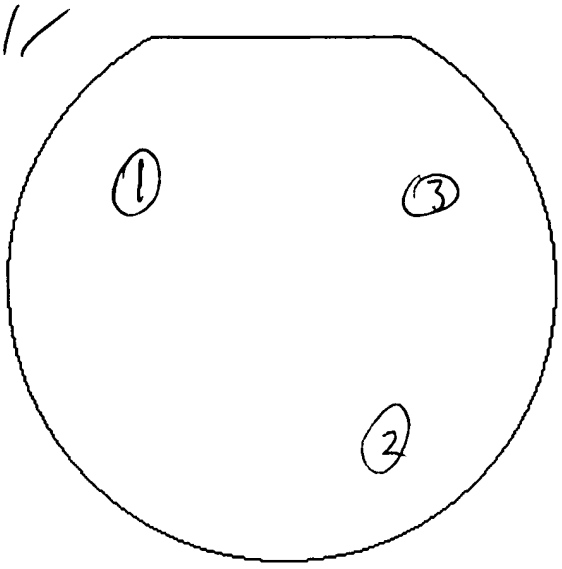
Resolution Fair | Resolution Poor

SMN 5/8/01

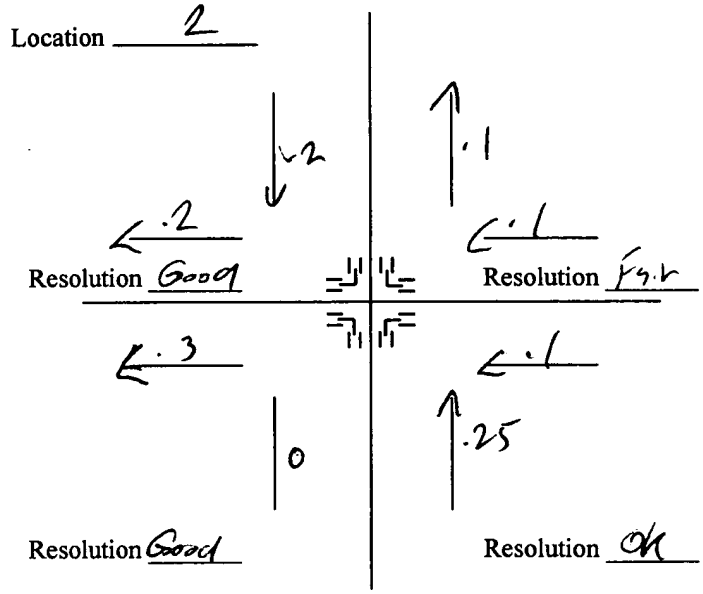
Lot #: ROC1-4 Wafer #: Wafer Layer #: 25

Location 1





Location 2



Avg x ← 0.1

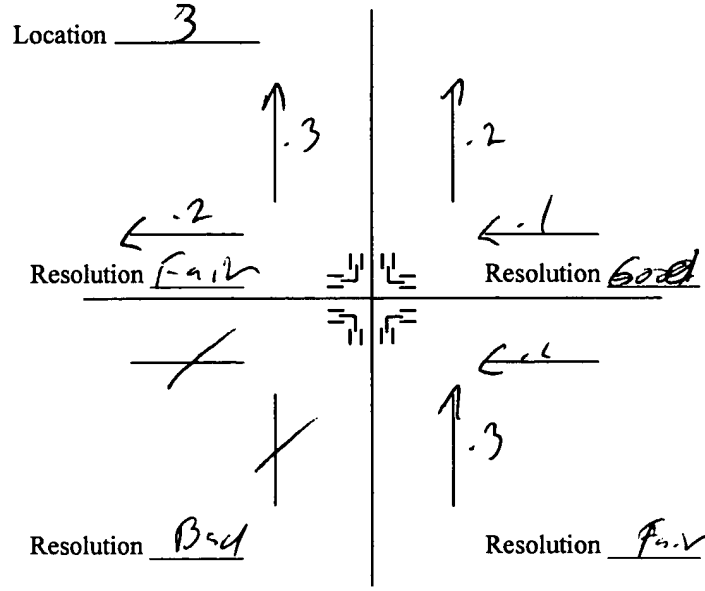
Avg y 0.21

☐ Rework

☒ Accept

Initials SN

Location 3



SMN 5/8/01

Lot #: ROC1-4 Wafer #: 22 Layer #: 25

Location 1

↑ .1 ↑ 0.2

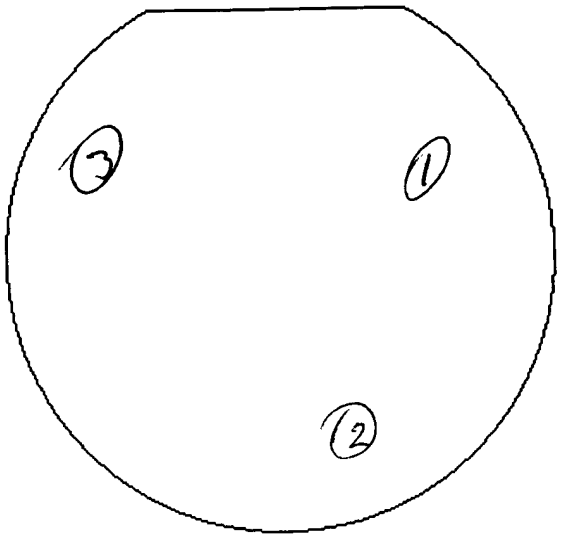
← 1 ← 0.1

Resolution good | Resolution ok

← .1 ← 0.1

↓ .1 | 0

Resolution good | Resolution ok



Location 2

↑ 0.1 ↑ 0.1

← 1 ← 0.1

Resolution fair | Resolution fair

← .2 ← 0.1

↑ 0.1 | 0

Resolution fair | Resolution fair

Avg x ← 0.1

Avg y 0.1 ↑

☐ Rework

☒ Accept

Initial S.N.

Location 3

↑ .1 | 0

← 1 ← 1

Resolution Good | Resolution ok

← 1 | 0

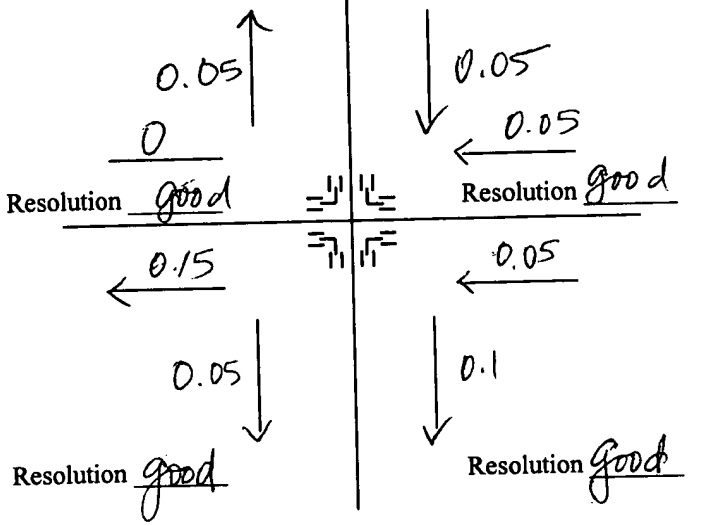
↓ .05 | ↑ .1

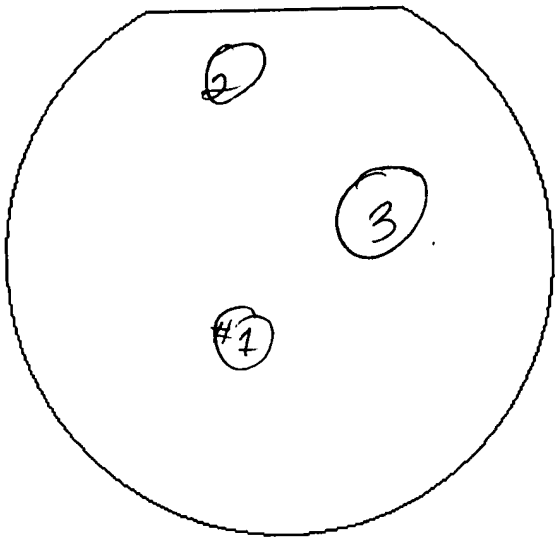
Resolution Good | Resolution Fair

SMN 5/8/01

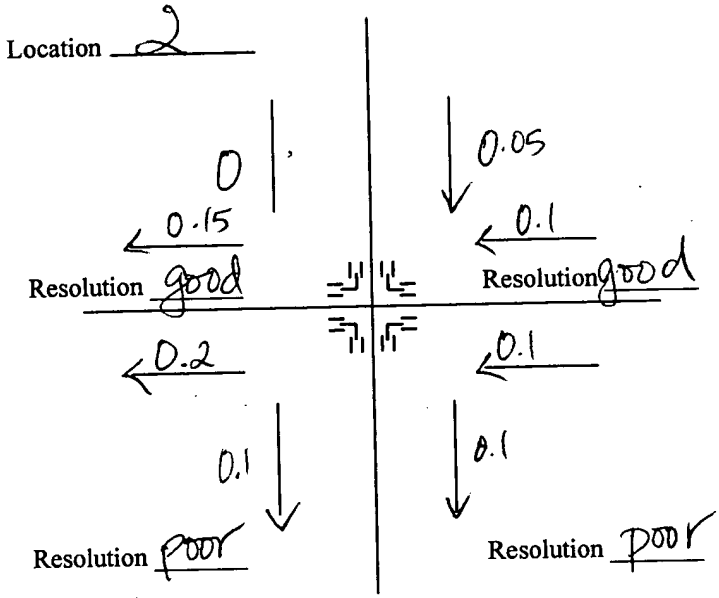
Lot #: ROC1-4 Wafer #: 21 Layer #: 25

Location 1





Location 2



Avg x ←0.1

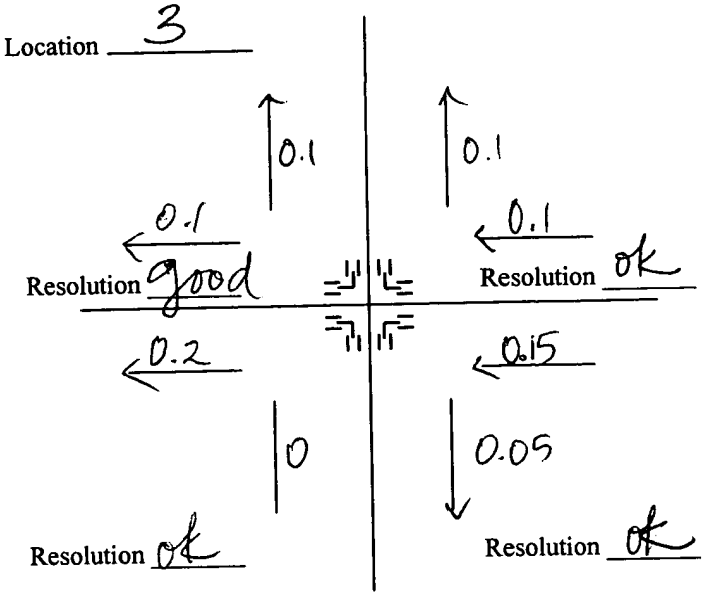
Avg y 0.05↑

Rework ☐

Accept ☒

Initial A.J. S.N.

Location 3



SMN 5/8/01

Date 6-6-01 Device 1LOC1 Lot # 4M

Layer 9 Resist ____ IR (y/n) ____ Charge # ____

Resist moves
Left +
Up +

Wafer # 22XT

Wafer Flat

Left

Right

9 → 1

Wafer # 22XT

Wafer Flat

Left

Right

6-6-01

Wafer # 7

Wafer Flat

Left

Right

Wafer # 25XT

Wafer Flat

Left

Right

Wafer # 21XT

Wafer Flat

Left

Right

Wafer # 7

Wafer Flat

Left

Right

Wafer #

Wafer Flat

Left

Right

Wafer #

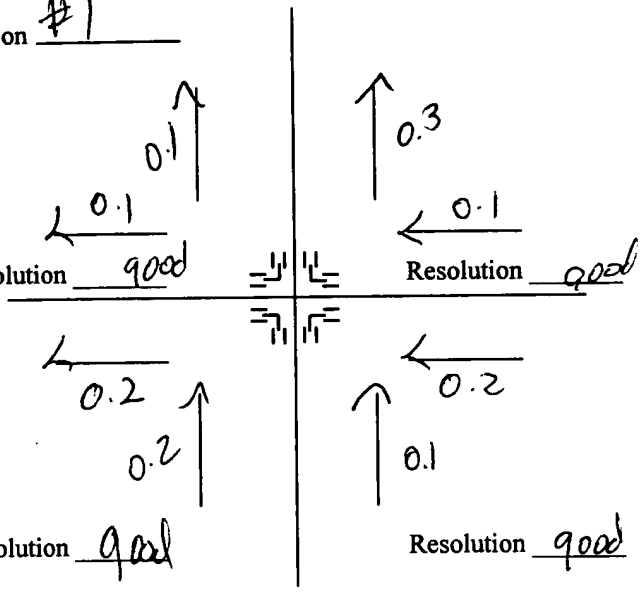
Wafer Flat

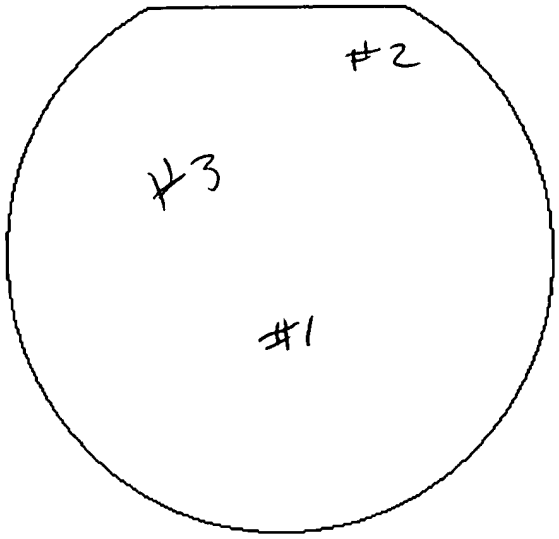
Left

Right

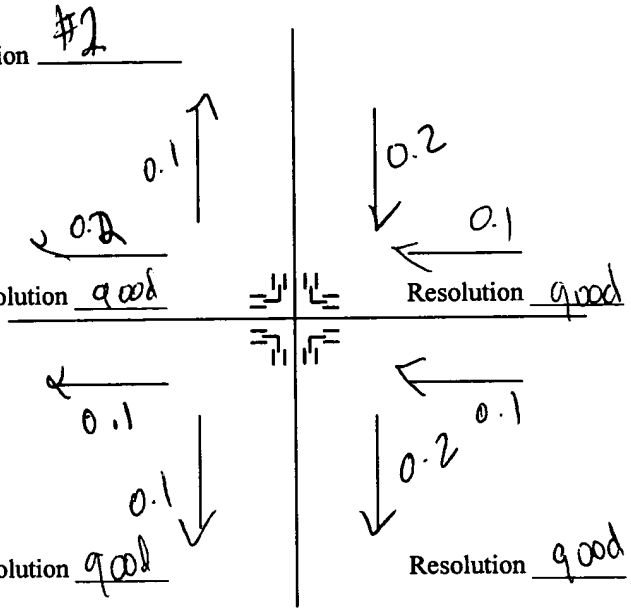
Lot #: Rac14A Wafer #: 25 Layer #: 9

Location #1





Location #2

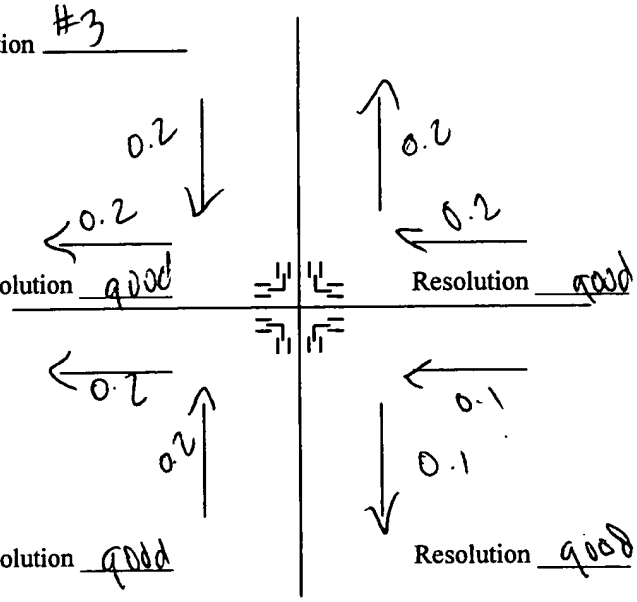


AVG. X 0.2
AVG. Y 0.2

☐ Rework
☐ Accept

Initial

Location #3



SMN 5/8/01

#1 Lot #: Rod 4A Wafer #: 21 Layer #: 9

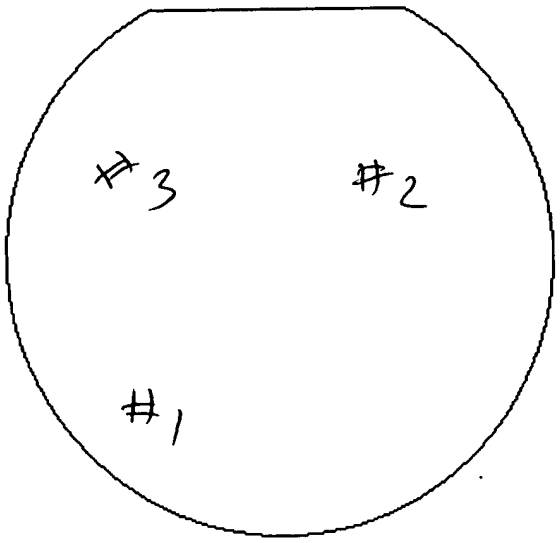
Location #1

0.2 ← 0.2 Resolution good

0.1 ← 0 Resolution good

0.1 ← 0.2 Resolution good

0.2 ↑ 0.1 Resolution good



Location #2

0.1 ← 0.2 Resolution good

0.3 ↑ 0.2 ← Resolution good

0.2 ← 0.3 Resolution good

0.2 ↑ Resolution good

AVG. X 0.2
AVG. Y 0.2

☐ Rework
☐ Accept

Initial JVA

Location #3

0.1 ↓ 0.1 ← Resolution good

0.3 ↑ 0.2 ← Resolution good

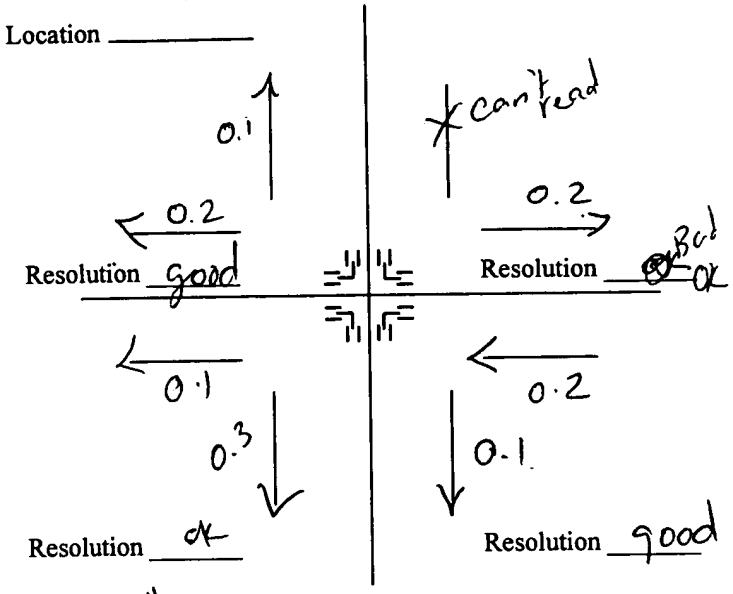
0.1 ← 0.1 ↑ Resolution good

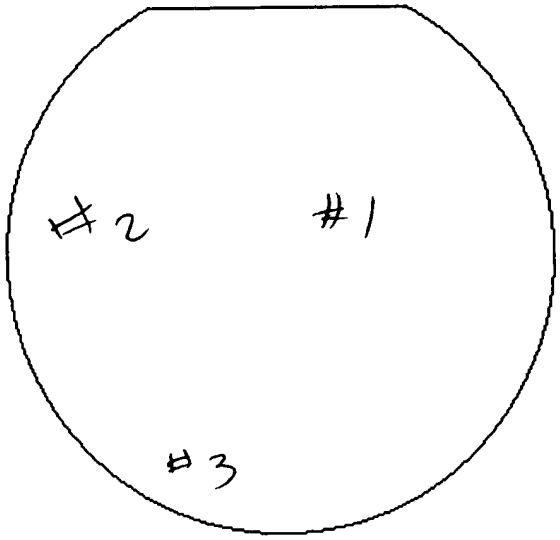
0.2 ← 0.2 ↓ Resolution good

SMN 5/8/01

#1 Lot #: Roc 1-4A Wafer #: 22 Layer #: 9

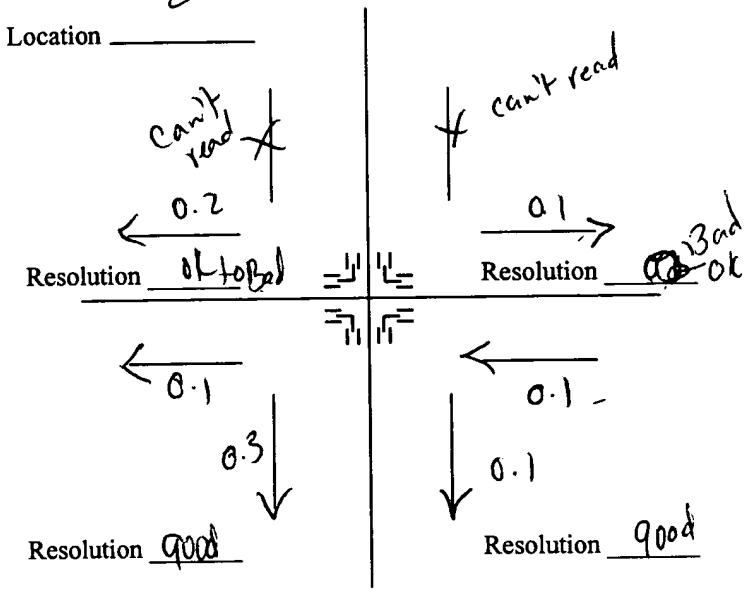
Location _____





#2

Location _____



AVG. X 0.1.5

AVG. Y 0.2

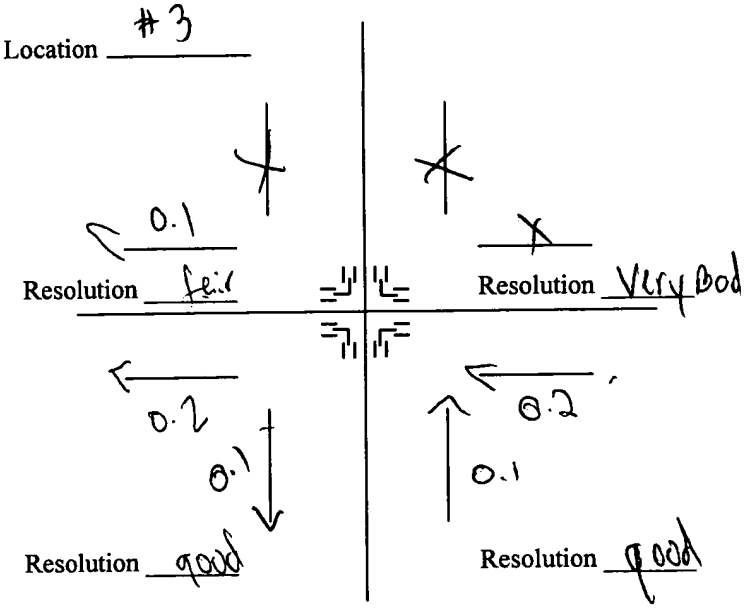
☐ Rework

☐ Accept

Initial _____

#3

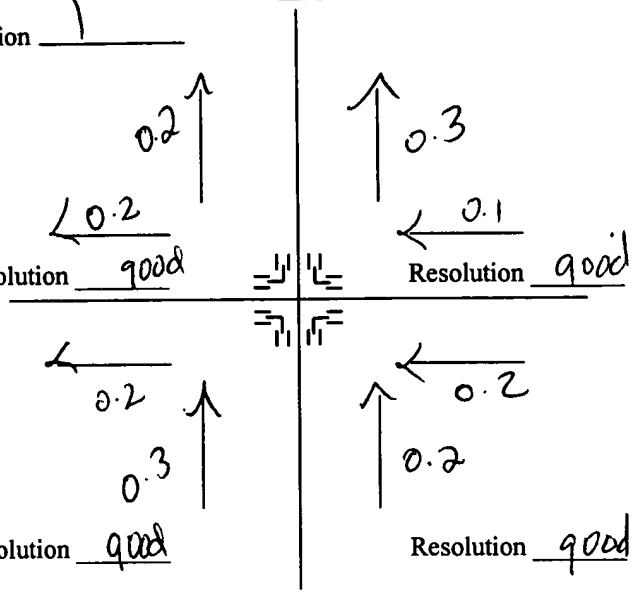
Location _____



SMN 5/8/01

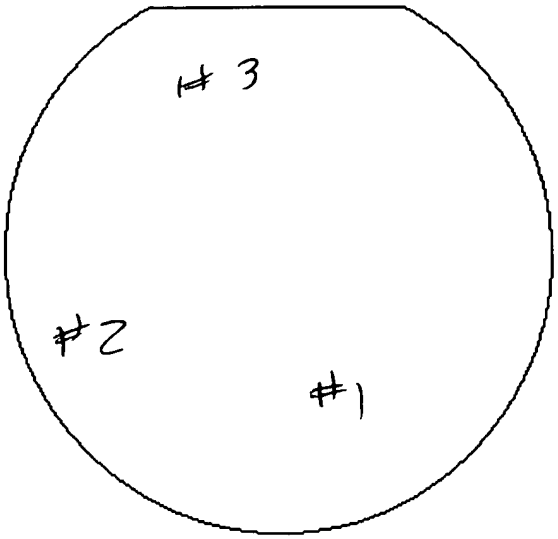
Lot #: Roc.1 W4A Wafer #: No # Layer #: 9

Location 1

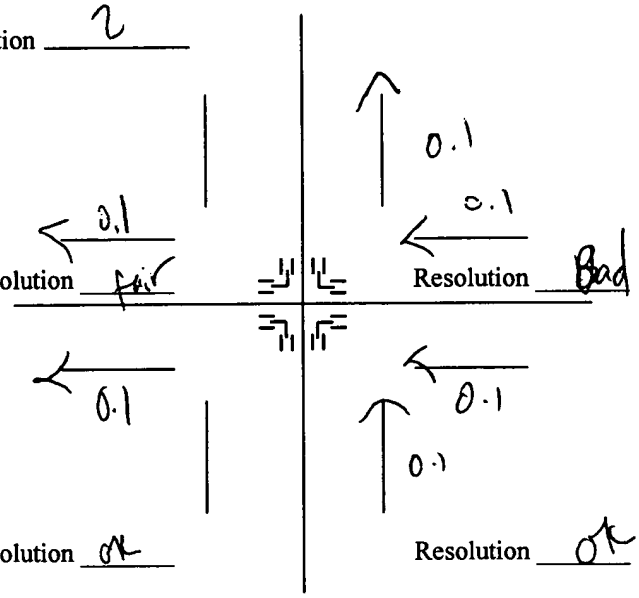


Resolution good Resolution good

Resolution good Resolution good



Location 2



Resolution fair Resolution Bad

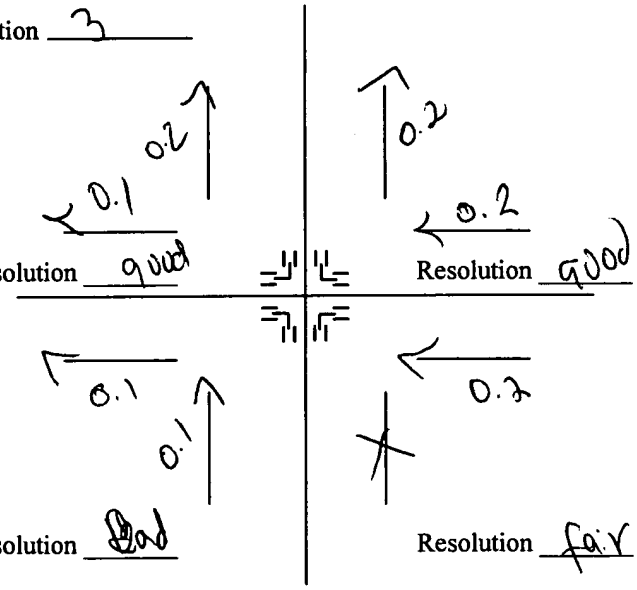
Resolution OK Resolution OK

AVG. X -2
AVG. Y .2

☐ Rework
☐ Accept

Initial JA

Location 3



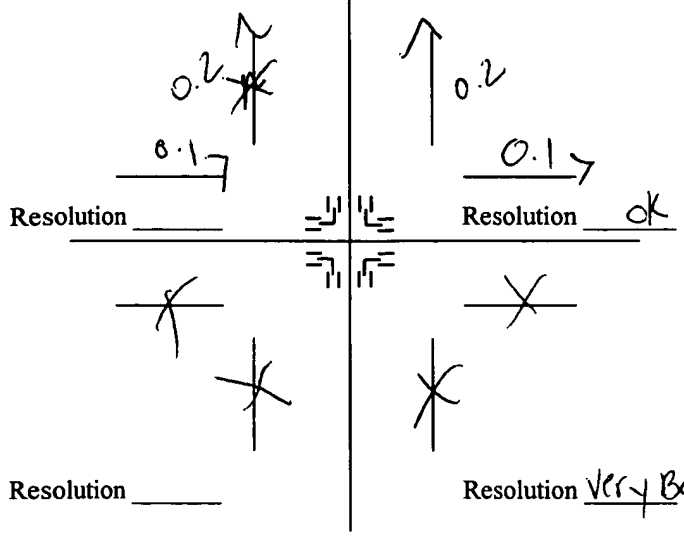
Resolution good Resolution good

Resolution Bad Resolution fair

SMN 5/8/01

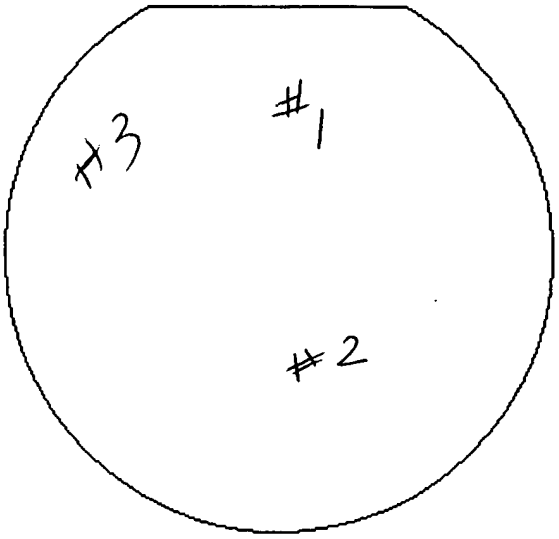
Lot #: Rocket4A Wafer #: no Layer #: 9

Location 1

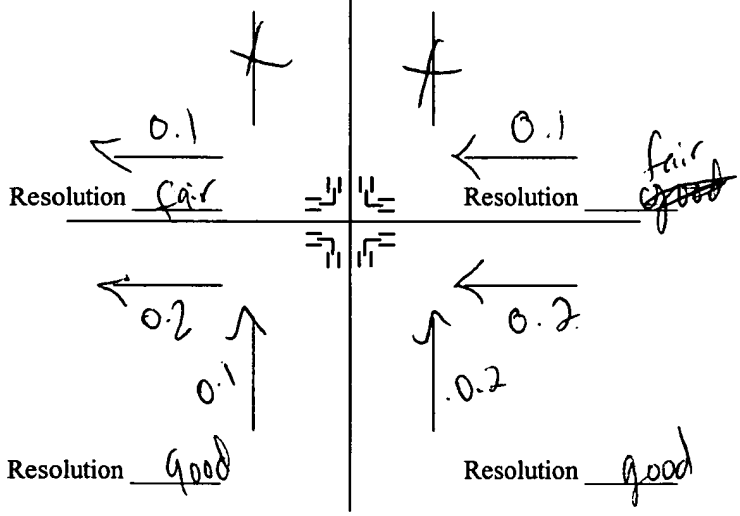


Resolution _____ Resolution ok

Resolution _____ Resolution Very Bad



Location 2



Resolution fair Resolution ~~good~~ fair

Resolution good Resolution good

AVG. X _____

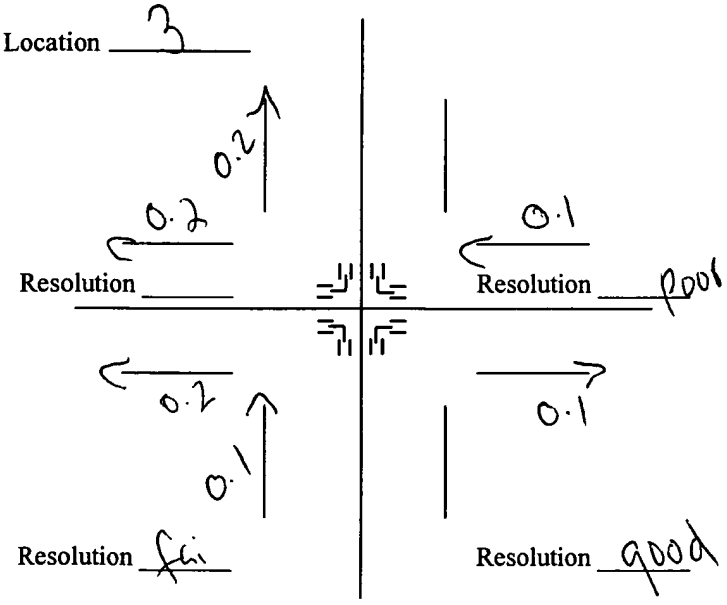
AVG. Y _____

☐ Rework

☐ Accept

Initial _____

Location 3



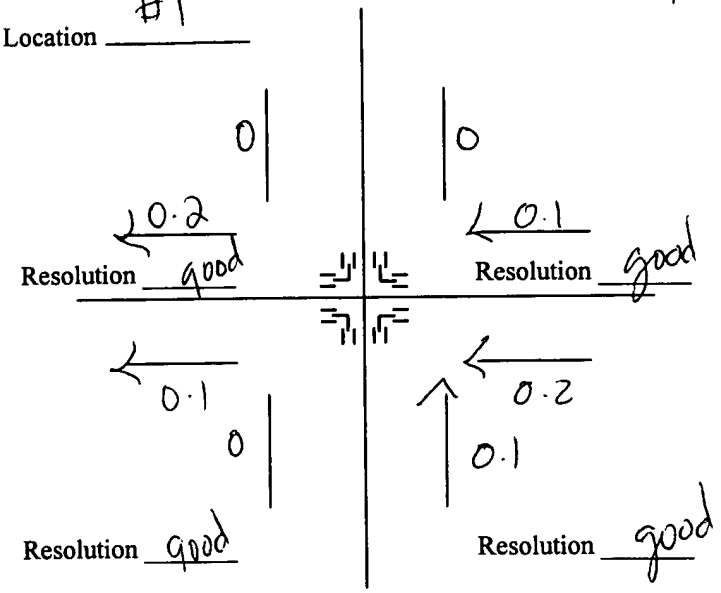
Resolution _____ Resolution poor

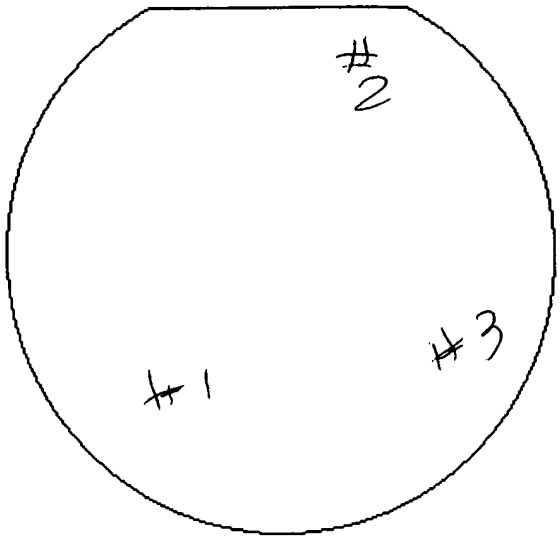
Resolution fair Resolution good

SMN 5/8/01

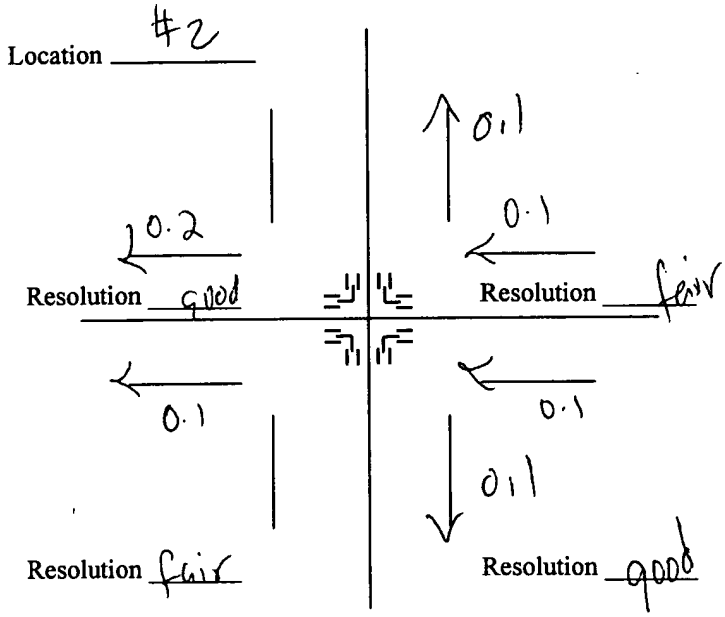
Lot #: Roc1 lot 4A Wafer #: No 4 Layer #: 9

Location #1





Location #2

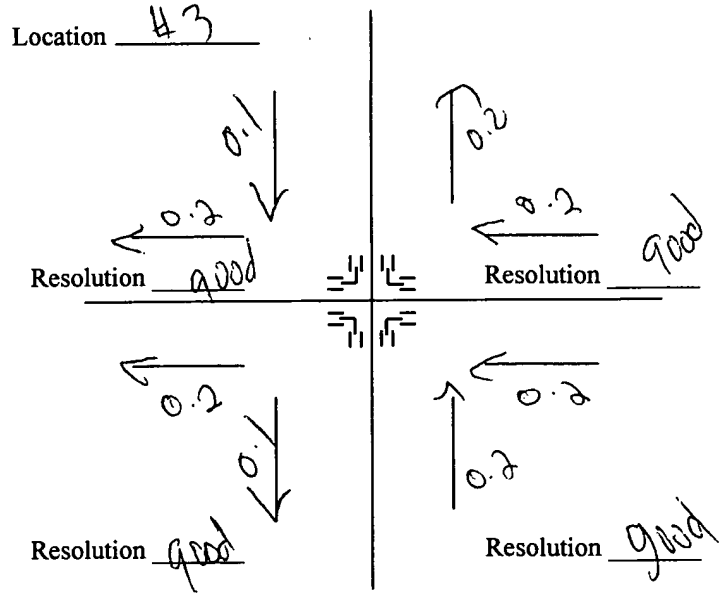


AVG. X _____
AVG. Y _____

☐ Rework
☐ Accept

Initial _____

Location #3

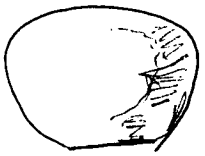


SMN 5/8/01

Rockwell Science Center InP HBT PROCESS LOT FOLLOWER Charge # 35016 – 87258-0000

M1	Wafers In	Wafers Out	Tools	Step operation	Op rati n recip	Operator/ Date
HMDS Dep	6	6	YES Oven	HMDS Dep	Program 0 ✓	6-5 PH
Apply resist/bake	6	6	Solitec Coat	Resist type 3500 RPM - 30 SEC	518 HOTPLATE 110C - 60 SEC	6-5 ER
Expose Device Mask	6	C	GCA Stepper	Mask / Reticle name Global align to DFAS align to Vernier align to Job name\ pass	ROC1/ Layer 9 1 1 1 MAP ROC11.4\M,9 EXP.52	
Image Reversal Bake	6	6	YES Oven	Ammonia Program:	3	
Flood	6	6	Flood Unit	Dose	2000 mJ ~~EXP~~	6-6 ER
Develop	6	6	Solitec DEV.	Develop Type: Develop Time:	701 ✓ 60 Sec. ✓	6-6 ER
Inspect wafers			Optical scope	View wafers	Equipment type A O Microscope ◊ Check for patterns properly developed ✓ ◊ Check alignment (+/- 0.3um) ✓ ◊ Smallest Resolution Pattern Read 0.8 (µm) Acceptance : Yes ✓, No	✓ 6-6 DH
Descum	6	6	Branson 1	Descum	O2, 500mT, 300W, 4min # 1141	
Dip Etch	6	6	Wet station	Dip, dry	20% HCl 30sec, DI rinse, 30sec, N2 blow dry	6-7 01
Metal deposition	6	6	CRYO evaporator	Metal dep Ti/Pt/Au Metal dep check	150 / 250 / 7000 98% Record film thickness from crystal monitor #79	III JVD ROY
Liftoff	6	6	Wet bench	Liftoff Rinse Dry	Acetone soak, >10min IPA soak, 1min N2 blow	S ~~OH~~ 6/7/01
Inspect wafers			Optical scope	Inspect wafers	Metal appearance	
Test						

Wafer # Identifying marks

IQE 027 →  "flat" back/matte

DHBT, no number → 

DHBT, no # →  shiny, mostly clean

IQE, 025 →  flat color

IQE, 021 →  flat color

IQE, 022 →  flat color, wha a mess!